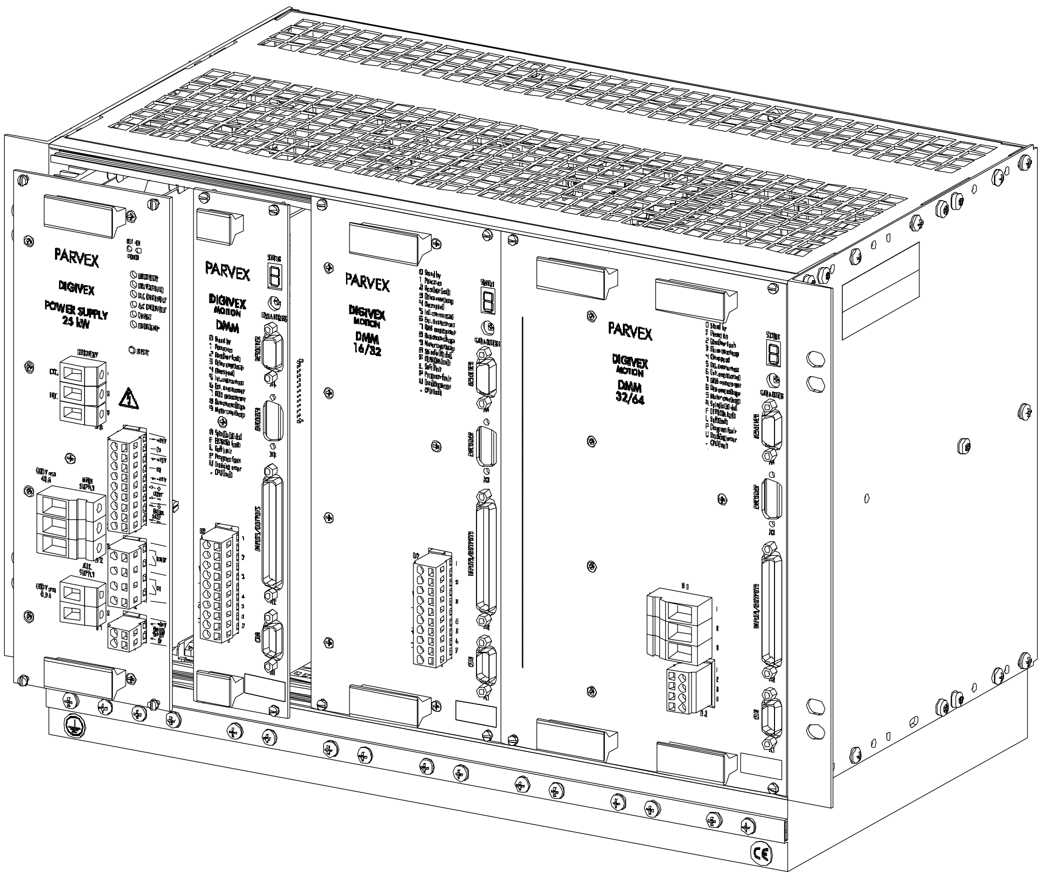
**SSD Parvex SAS**
8, avenue du Lac - B.P. 249
F-21007 Dijon Cedex
www.SSDdrives.com

# DIGIVEX Multi Motion

**Digital servoamplifier**

## User and commissioning manual

**PVD 3523 GB – 04/2004**



# PRODUCT RANGE

## 1 - « BRUSHLESS » SERVODRIVES

**TORQUE OR POWER RANGES**

- **BRUSHLESS SERVOMOTORS**, LOW INERTIA, WITH RESOLVER

  Very high torque/inertia ratio (high dynamic performance machinery):
  - ⇒ NX -HX - HXA — 1 to 320 N.m
  - ⇒ NX - LX — 0.45 to 64 N.m

  High rotor inertia for better inertia load matching:
  - ⇒ HS - LS — 3,3 to 31 N.m

  Varied geometrical choice :
  - ⇒ short motors range HS - LS — 3,3 to 31 N.m
  - ⇒ or small diameter motors : HD, LD — 9 to 100 N.m

  Voltages to suit different mains supplies :
  - ⇒ 230V three-phase for «série L - NX»
  - ⇒ 400V, 460V three-phase for «série H - NX»
- **"DIGIVEX Drive" DIGITAL SERVOAMPLIFIERS**
  - ⇒ SINGLE-AXIS DSD
  - ⇒ COMPACT SINGLE-AXIS DμD, DLD
  - ⇒ POWER SINGLE-AXIS DPD
  - ⇒ MULTIPLE-AXIS DMD
- "PARVEX Motion Explorer" ADJUSTING SOFTWARE

## 2 - SPINDLE DRIVES

- **SPINDLE SYNCHRONOUS MOTORS**
  - ⇒ "HV" COMPACT SERIES
  - ⇒ "HW" ELECTROSPINDLE,frameless, water-cooled motor — From 5 to 110 kW up to 60,000 rpm
- **"DIGIVEX" DIGITAL SERVOAMPLIFIERS**

## 3 - DC SERVODRIVES

- **"AXEM", "RS" SERIES SERVOMOTORS** — 0.08 to 13 N.m
- **"RTS" SERVOAMPLIFIERS**
- **"RTE" SERVOAMPLIFIERS** for DC motors + resolver giving position measurement

## 4 - SPECIAL ADAPTATION SERVODRIVES

- **"EX" SERVOMOTORS** for explosive atmosphere
- **"AXL" COMPACT SERIES SERVOREDUCERS** — 5 to 700 N.m

## 5 - POSITIONING SYSTEMS

- **Numerical Controls « CYBER 4000** » 1 to 4 axes
- **"CYBER 2000"** NC 1 to 2 axes
- **VARIABLE SPEED DRIVE - POSITIONER**
  - ⇒ SINGLE-AXIS DSM
  - ⇒ POWER SINGLE-AXIS DPM
  - ⇒ MULTIPLE-AXIS DMM
- ADJUSTMENT AND PROGRAMMING SOFTWARE PARVEX Motion Explorer

# CONTENTS

Characteristics and dimensions subject to change without notice.

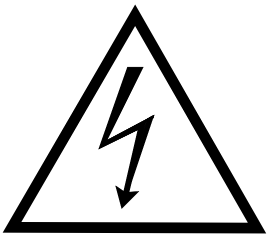
**YOUR LOCAL CORRESPONDENT**

**SSD Parvex SAS**
8 Avenue du Lac / B.P 249 / F-21007 Dijon Cedex
Tél. : +33 (0)3 80 42 41 40 / Fax : +33 (0)3 80 42 41 23
www.SSDdrives.com

## SAFETY

Servodrives present two main types of hazard :

**- Electrical hazard**



Servoamplifiers may contain non-insulated live AC or DC components. Users are advised to guard against access to live parts before installing the equipment.

Even after the electrical panel is de-energized, voltages may be present for more than a minute, until the power capacitors have had time to discharge.

Specific features of the installation need to be studied to prevent any accidental contact with live components :
- Connector lug protection ;
- Correctly fitted protection and earthing features ;
- Workplace insulation
  (enclosure insulation humidity, etc.).

**General recommendations :**

- Check the bonding circuit;
- Lock the electrical cabinets;
- Use standardised equipment.



**- Mechanical hazard**

Servomotors can accelerate in milliseconds. Moving parts must be screened off to prevent operators coming into contact with them. The working procedure must allow the operator to keep well clear of the danger area.

All assembly and commissioning work must be done by **<u>qualified</u>** personnel who are familiar with the safety regulations (e.g. VDE 0105 or accreditation C18510).

**Upon delivery**

All servoamplifiers are thoroughly inspected during manufacture and tested at length before shipment.

- Unpack the servoamplifier carefully and check it is in good condition.
- Also check that data on the manufacturer's plate comries with data on the order acknowledgement.

If equipment has been damaged during transport, the addressee must file a complaint with the carrier by recorded delivery mail <u>within 24 hours</u>.

<u>Caution</u> :

The packaging may contain essential documents or accessories, in particular :

- User Manual,
- Connectors.

**Storage**

Until installed, the servoamplifier must be stored in a dry place safe from sudden temperature changes so condensation cannot form.

**Special instructions for setting up the equipment**

| | **CAUTION** |
|---|---|
|  | For this equipment to work correctly and safely it must be transported, stored, installed and assembled in accordance with this manual and must receive thorough care and attention..<br><br>Failure to comply with these safety instructions may lead to serious injury or damage.<br><br>The cards contain components that are sensitive to electrostatic discharges. Before touching a card you must get rid of the static electricity on your body. The simplest way to do this is to touch a conductive object that is connected to earth (e.g. bare metal parts of equipment cabinets or earth pins of plugs). |

# 1. GENERAL PRESENTATION

## 1.1 List of published DIGIVEX Motion manuals

| | | |
|---|---|---|
| ♦ DIGIVEX Single Motion (DSM) User Manual | (DSM) | PVD3515 |
| ♦ DIGIVEX Power Motion (DPM) User Manual | (DPM) | PVD3522 |
| ♦ DIGIVEX Multi Motion (DMM) User Manual | (DMM) | PVD3523 |
| ♦ DIGIVEX Motion - CANopen | | PVD3518 |
| ♦ DIGIVEX Motion - Profibus | | PVD3554 |
| ♦ PME-DIGIVEX Motion Adjustment Manual | | PVD3516 |
| ♦ DIGIVEX Motion Directory of Variables | | PVD3527 |
| ♦ DIGIVEX Motion Programming | | PVD3517 |
| ♦ DIGIVEX Motion - Cam Function | | PVD3538 |
| ♦ PME Tool kit User and Commissioning Manual | | PVD3528 |
| ♦ CANopen - CAN Bus Access via CIM03 | | PVD3533 |
| ♦ CANopen - Remote control using PDO messages | | PVD3543 |
| ♦ "Block Positioning" Application Software | | PVD3519 |
| ♦ "Fly shear linear cutting" software application | | PVD3531 |
| ♦ "Rotary blade cutting" software application | | PVD3532 |
| ♦ Motor user's manuals: | | |
| ◊ HX/HS/HD | | PVD3490 |
| ◊ NX | | PVD3535 |

## 1.2 «DIGIVEX Multi Motion» general concepts

Les modules existent en 3 dimensions et 5 calibres : 2/4, 4/8, 8/16, 16/32, 32/64.

"DMM" servoamplifiers are designed to control "H" or "NX" series, magnet-type, synchronous, brushless motors (400 V power supply).

A multi-axis “DIGIVEX Multi Motion” electronic control system made up of :

- a rack,
- a power supply module that draws the 400 V / 50-60 Hz mains supply directly and outputs 550 V bus voltage. This module also controls energy discharge via internal or external resistors.
- Control and positioning modules connected to the servomotor (power and resolver).

Control and positioning modules are designed to provide:

- positioning or synchronization functions from,
  - ♦ either the motor resolver,
  - ♦ or an external incremental encoder
- plc-type logic functions
- message or parameter transfers via a CANopen or Profibus field bus.

Parameters specification (current, speed, position) and programming (pseudo BASIC or applicative programs) are done by PC with "PME - DIGIVEX Motion" software (under WINDOWS). A 7-segment display provides a direct readout of the main drive statuses.

# 1.3 System components

The rack provides the following functions :

- Mechanical support of power supply and drive cards.
- Support for regeneration resistors and power bus capacitors.
- Power transfer from supply to drive (550 V power bus).
- Low-level supply transfer from DIGIVEX Power Supply to DIGIVEX Drive (low-level bus).
- Logic signal transfer between drive and power supply :
    - ♦ Drive OK
    - ♦ Reset
- Emergency stop control
- 24V brake supply transfer. The 24V filtered-regulated supply is not part of our supply, (see brake connection).

A DSM drive system comprises as a minimum:

- A rack system containing a 400V threephased alimentation DIGIVEX Power Supply
- One or several servoamplifier DIGIVEX Motion
- A mains filter for compliance with CE requirements
- An H or NX series (400 V supply) brushless motor with a resolver-type position sensor and thermal protective sensor. The motor may be equipped with a brake (see motor code).
- A control unit for activating the stored programs via DSM inputs / outputs (contacts, push buttons, and possibly an external plc).

It may also feature:

- Additive chokes located close to the drive between the motor and drive where long cables are used.
- A supplementary resistor for "recovering" braking energy where there is high inertia and short cycles
- An option
    - ♦ "external encoder input" for "master-slave" type operations or for applications requiring position acknowledgement on the machine and not the motor.

      OR
    - ♦ "encoder emulation output" (with resolution adjustable from 1 to 16,384 marks per revolution).
- Connection cables (supplied by Parvex).

Regulation parameter specification, drive setting and user program entry or modification is done exclusively by PC with PME-DIGIVEX Motion software.

The drives are fitted, depending on the reference, with CANopen (DMMxxxxxC) or Profibus (DMMxxxxxP) communication inputs as standard.

DIGIVEX Power Supply

The power supply is located at the left side of the rack :

- Receives 400 V three-phase mains supply and provides dc power (550 V internal bus) to the DIGIVEX servoamplifiers (terminal block B2).
- Receives the 400V single phase auxiliary supply (terminal block B1) as input and provides 550V direct voltage as output. Each DIGIVEX Drive generates its own ±15V, 5V and 24V voltages from this "low level bus".
- May receive 24 V supply for servomotor brakes and distributes it to drives via the internal bus (terminal block X1).
- Braking energy dissipation (terminal block B3 on 25 kW calibre).
- 24 V and ± 15V "customer" auxiliary supplies (terminal block X3).
- Logic interface with main switch (terminal block X2).
- Interface with emergency stop and external reset (terminal block X3).

Two versions of the power supply are available :

- 12 kW DIGIVEX Power Supply (rectified current = 25 A)
- 25 kW DIGIVEX Power Supply (rectified current = 50 A)

The 12 or 25 kW can be considered as the sum of the mechanical power really used simultaneously by the axis at a given time.

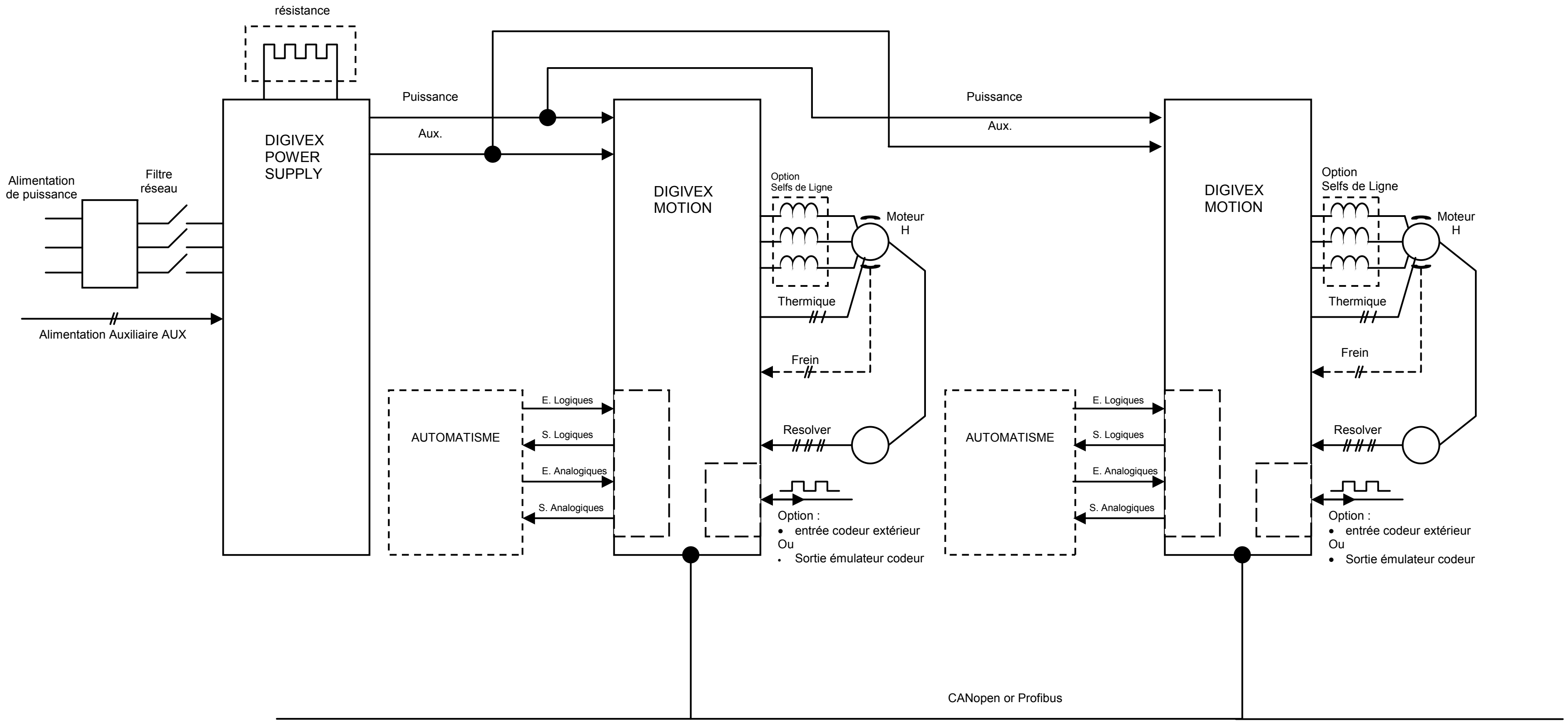
A series of LEDs is used to check the status of the power supply and drives

Possible Combinations

Different versions of several rack models are available :

- 6-location single module racks (19 inch, double Europe rack).
- 3-location single module racks.
- Single module 13-slot racks (19-inch 15U rack).

Rack composition is further restricted by the POWER SUPPLY format.


résistance
Puissance
Aux.
DIGIVEX
POWER
SUPPLY
Alimentation
de puissance
Filtre
réseau
Alimentation Auxiliaire AUX
DIGIVEX
MOTION
Option
Selfs de Ligne
Moteur
H
Thermique
Frein
Resolver
AUTOMATISME
E. Logiques
S. Logiques
E. Analogiques
S. Analogiques
Option :
• entrée codeur extérieur
Ou
• Sortie émulateur codeur
Puissance
Aux.
DIGIVEX
MOTION
Option
Selfs de Ligne
Moteur
H
Thermique
Frein
Resolver
AUTOMATISME
E. Logiques
S. Logiques
E. Analogiques
S. Analogiques
Option :
• entrée codeur extérieur
Ou
• Sortie émulateur codeur
CANopen or Profibus

# 2. GENERAL CHARACTERISTICS

## 2.1 Power Supply Modules

| TYPE | MAINS | MEAN BUS CURRENT | RATED BUS VOLTAGE | REGENERATION |
|---|---|---|---|---|
| DIGIVEX SUPPLY 12 kW | 400 V+/-10%<br>50 - 60 Hz | 25 A | 540 V | INTERNAL RESISTOR |
| DIGIVEX SUPPLY 25kW | 400 V+/-10%<br>50 - 60 Hz | 50 A | 540 V | INTERNAL OR EXTERNAL RESISTOR |

400 V rms three-phase mains supply via terminal block B2 : **terminals U1 - V1 - W1**
Single-phase operations possible (downgraded mode, please ask for details).
50/60 Hz mains supply voltage must be greater than 200 V rms and less than 470 V rms; a transformer or an auto transformer is necessary for use with 460 V ± 10% or 480 V ± 10% mains supply.

Current : **20 A** rms for 12 kW POWER SUPPLY
**40 A** rms for 25 kW POWER SUPPLY

Power loss with temperature :
- Power loss of 2% per °C above 40°C.
- Max. ambient temperature 60°C.

A thermal sensor trips the OK relay when the dissipater reaches 85°C.

Power loss with altitude: Power loss of 1% per 100 m above 1,000 m.

"MAIN SUPPLY " terminal block B2: Marked U1 - V1 - W1.

Mains monitoring :
- No phase (see strap ST1).
- Maximum mains voltage (470 V).

Power bus monitoring :
- Maximum bus voltage (750 V).
- Minimum bus voltage (200 V).

Power dissipated :
- 12 kW power supply : 50 W.
- 25 kW power supply : 100 W.

## 2.2 Servoamplifier Modules

| TYPE | PEAK PERMANENT CURRENT | PEAK PULSE CURRENT * | POWER DISSIPATED | LOW-LEVEL CONSUMPTION ** | MODULE FORMAT |
|---|---|---|---|---|---|
| DMM 2/4 | 2 A | 4 A | 20 W | 20 W | SINGLE |
| DMM 4/8 | 4 A | 8 A | 35 W | 20 W | SINGLE |
| DMM 8/16 | 8 A | 16 A | 70 W | 20 W | SINGLE |
| DMM 16/32 | 16 A | 32 A | 130 W | 20 W | DOUBLE |
| DMM 32/64 | 32 A | 64 A | 260 W | 25 W | TRIPLE |

* Peak pulse current up to 2 s, non repetitive

** En cas d'utilisation d'une carte option émulation codeur ajouter 5 W

## 2.3 General characteristics of the DMM

| | |
|---|---|
| Power reduction with altitude | Above 1000 m, service power falls by 1% for every 100 m up to a maximum altitude of 4000 m |
| Operating temperature | Normal use: 0 - 40°C<br>Above 40°C, service power fall by 20% for every 10°C up to a maximum temperature of 60°C. |
| relative humidity | 85% (without condensation) |
| Storage temperature | -30°C to +85°C |
| Chopping frequency | 8 kHz |
| Current bandwidth | 600Hz to -3dB |
| Speed bandwidth | Up to 60Hz |
| Maximum speed | Driven by DMM : 60,000 rpm |
| Electrical protection | Electrical isolation of power bridge<br>Mean current protection depending on drive rating<br>Pulse current protection of drive and motor<br>rms current protection of motor<br>Protection against short circuits at bridge output |
| Mechanical protection | IP20 under IEC 529 |
| Other monitoring | Tracking error<br>Motor temperature<br>Drive temperature<br>No resolver<br>Brake supply<br>Limit switches |
| User programs<br>Memory sizes | FLASH_DM : 512 Kilobyte<br>PROG_DM : 256 Kilobyte |

Communication bus:

- CANopen: DMMxxxxxC reference positioner drives
- Profibus: DMMxxxxxP reference positioner drives

# 3. COMPLIANCE WITH STANDARDS

The CE mark is affixed to the front panel of the rack (on the ventilation block).

DIGIVEX DRIVE and DIGIVEX POWER SUPPLY bear the CE mark under European Directive 89/336/EEC as amended by Directive 93/68/EEC on electromagnetic compatibility. This European Directive refers to the harmonised generic standards EN50081-2 of December 1993 (Electrical Compatibility - Generic Standard for Emissions - Industrial Environments) and EN50082-2 of June 1995 (Electromagnetic Compatibility - Generic Standard for Immunity - Industrial Environments). These two harmonised generic standards are based on the following standards :

- EN 55011 of July 1991 : Radiated and conducted emissions
- EN 50140 of August 1993 and ENV 50204 : Immunity to radiated electromagnetic fields
- EN 61000-4-8 of February 1994: Mains frequency magnetic fields
- EN 61000-4-2 of June 1995 : Electrostatic discharge
- ENV 50141 of August 1993 : Interference induced in cables
- EN 61000-4-4 of June 1995 : Rapid transient currents

Compliance with the reference standards above implies adherence to the instructions and wiring diagrams in the technical documents supplied with the appliances.

**Incorporation in Machinery**

The design of the equipment means it can be used in machinery covered by Directive 89/392/EEC (Machine Directive) provided that it is integrated (or incorporated and/or assembled) in accordance with the rules-of-the-art by the machinery manufacturer and in keeping with the instructions in this booklet.

# 4. BRAKING ENERGY DISSIPATION

Braking energy is dissipated by a **rack-mounted** resistor for the 12 kW power supply, or **rack-mounted or external** resistor for the 25 kW power supply.

Regeneration is controlled on the basis of two voltage limits measured across the power bus :
- Resistor cuts in at U = 700 V.
- Resistor cuts out at U = 690 V.

Upon energising the system tests the value of the current through the braking resistor. It should be 10 A < I $\leq$ 70 A. This means either no resistance (break) or a short circuit can be detected. If a fault occurs the OK relay is tripped.

There are two models of external resistor in insulated enclosures (See § 5.3) :
- 2 kW - 27 Ω (RE91001).
- 4.5 kW - 12 Ω (RE91002).

**12 kW Power Supply with internal rack resistor**

Internal resistor only whose temperature is monitored by thermal sensor.

**25 kW Power Supply with internal rack resistor**
In terminal block B3 there must be a strap between terminals INT B3/2 - B3/3.

**CAUTION :** Strap ST2 must remain in position 2-3 without fail. See § 4.1.1 for strap positions.

**Power Supply with external resistor**
In terminal block B3 there is not strap between terminal INT (B3/2 and B3/3). The external resistor is connected between terminal EXT (B3/1 B3/2).

**SUMMARY CHART OF BRAKING ENERGY DISSIPATION ARRANGEMENTS FOR POWER SUPPLY MODULES**

| | | 12 kW POWER SUPPLY | 25 kW POWER SUPPLY | | |
|---|---|---|---|---|---|
| | | INTERNAL RESISTOR | INTERNAL RESISTOR | EXTERNAL RESISTOR | |
| | | | | RE 91002 | RE 91001 |
| Resistor value | Ω | 22 (66) | 22 | 12 | 27 |
| Max. current | A | 32 (10) | 32 | 60 | 26 |
| Pulse power | kW | 22 (7.5) | 22 | 40 | 18 |
| Permanent power | kW | 1.1 (0.37) | 1.1 | 4.5 | 2 |
| **ST2 in position 2-3 (Int Res)** | | | | | |
| Max. non-repeat time | s | 2 | 2 | 2 | 2 |
| Max. repeat cycle time | s | 0.2 | 0.2 | 0.2 | 0.2 |
| Repetition | % | 5 | 5 | 5 | 5 |
| **ST2 in position 1-2 (Ext Res)** | | | | | |
| Max. non-repeat time | s | N/A | N/A | 5 | 5 |
| Max. repeat cycle time | s | N/A | N/A | 0.5 | 0.5 |
| Repetition | % | N/A | N/A | 12 | 12 |

**(--) Values for reduced ventilation racks.**

**Max. current :** Maximum controlled current, the resistor is activated at 700 V, the controlled current is equal at most to 700 / resistor value.

**Pulse power :** Maximum power dissipated by the resistor, this power can only be demanded for short periods and in keeping with a specific cycle.

**Permanent power** : Mean power that can be dissipated permanently by the resistor.

**Max. non-repeat time :** Maximum time in seconds for which pulse power can be demanded (from cold); the resistor must be allowed to cool before braking again. With internal resistors, temperature is monitored by a thermal sensor.

**Max. repeat cycle time :** Maximum time in seconds during which pulse power can be demanded provided that the power is established for only a certain percentage of the total time (repetition).

N.B. The characteristics given for external resistors correspond to natural ventilation conditions of these resistors and at an ambient temperature not exceeding 30°C.

Regeneration monitoring.

- Upon starting, detection of resistor presence. This prohibits starting (OK relay remains open) if the resistor is broken or short-circuited (strap on terminal block B3 in wrong position).
- In addition monitoring is carried out at each regeneration period.
- During operation the internal resistor temperature is monitored.

**Calculation of power dissipation by braking resistor**

The permanent and pulse power values shown in the previous table are limited by the braking resistor characteristics.
Where the application includes intensive cycles or long periods of deceleration, the mean power to be dissipated by each drive must be calculated.

$$\text{Power (Watts)} = \frac{J}{2}\left(\frac{N}{9.55}\right)^2 .f$$

J : Moment of inertia of servomotor and load, in $kgm^2$.
N : Angular speed of motor shaft at start of braking, in rpm.
f : Repetition frequency of braking cycles in $s^{-1}$.

The formula is for the worst-case scenario. Where the mechanical parts produce substantial friction or reverse yield is low, the power to be dissipated may be substantially less.

The total power to be dissipated from all drives must not exceed the permissible permanent power for the resistor. Durations and repetitions must not exceed the values in the preceding table.

# 5. SPACE REQUIREMENTS, ASSEMBLY, LABELLING, CODES

## 5.1 Dimensions and mounting

Two sizes of rack are available in three versions :

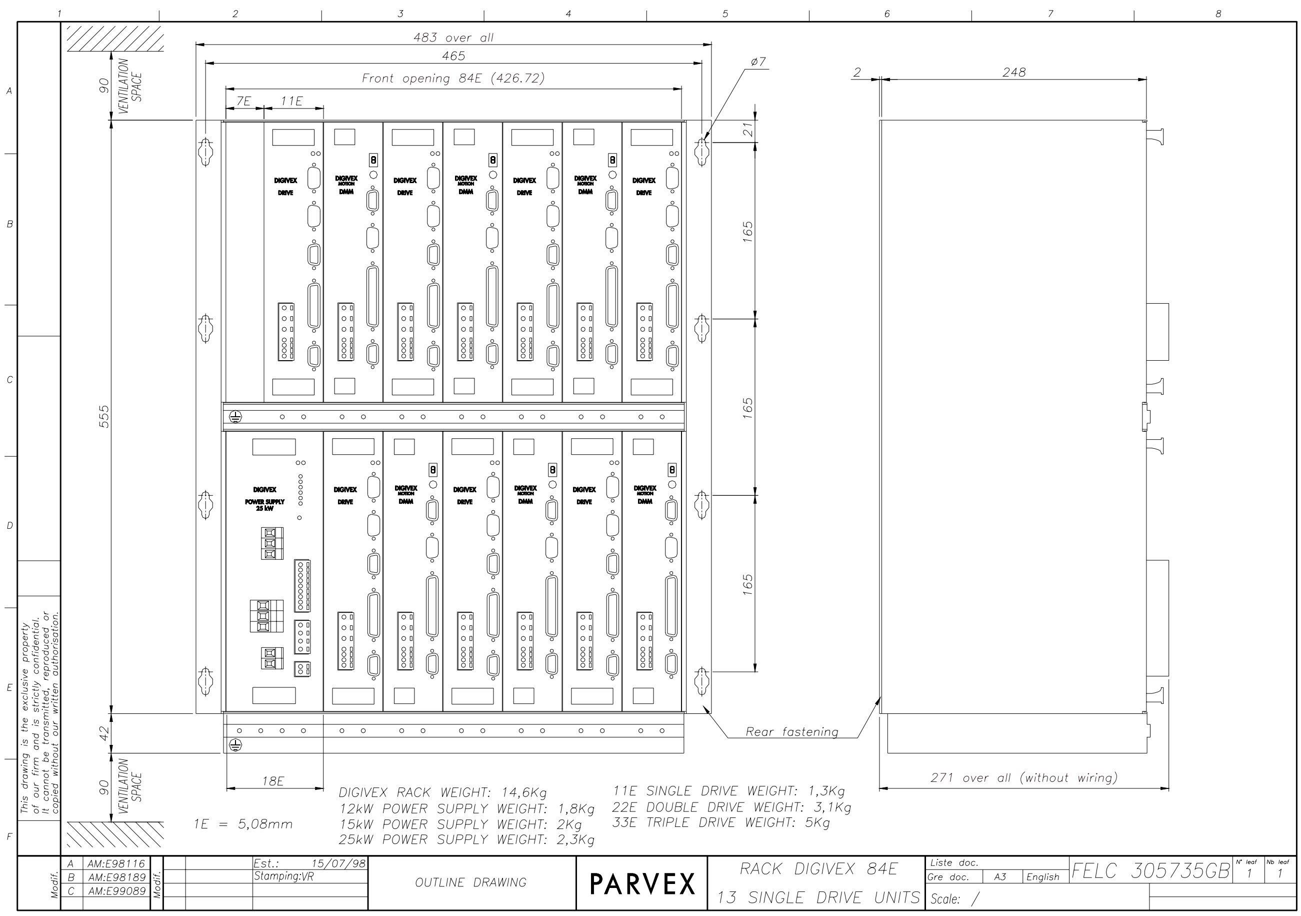
- Rack to accommodate six single format servoamplifier modules in addition to the POWER SUPPLY
- Half-rack to accommodate three single format servoamplifier modules in addition to the POWER SUPPLY.

For each size, the following three versions are available :

- Standard ventilation and internal braking energy dissipation resistor;
- Standard ventilation and external braking energy dissipation resistor;
- Compact ventilation and internal braking energy dissipation resistor (reserved for cases where all DIGIVEX DRIVES are less than or equal to 4/8 calibre).

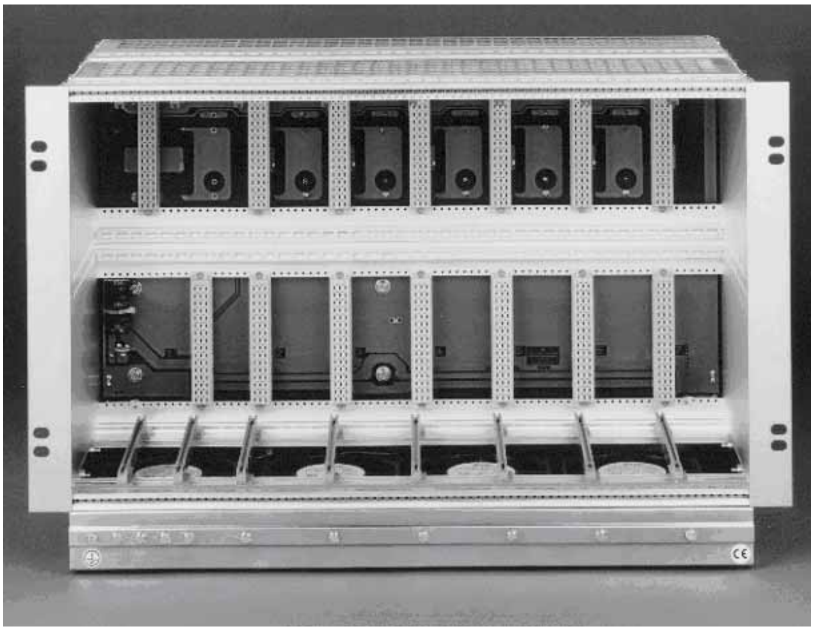
The fans are powered by the low-level source from the POWER SUPPLY.

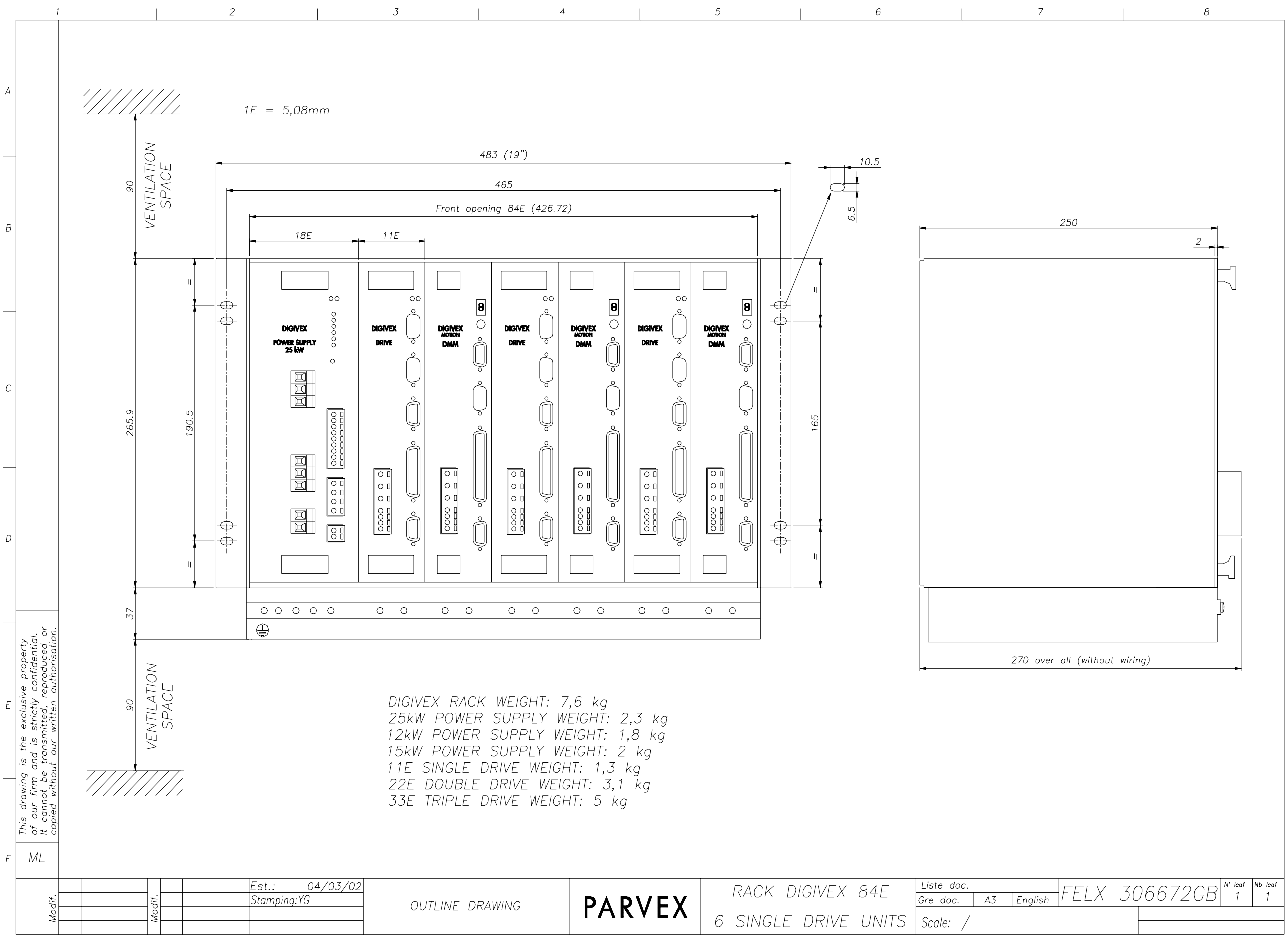
13 LOCATION SINGLE MODULE RACK



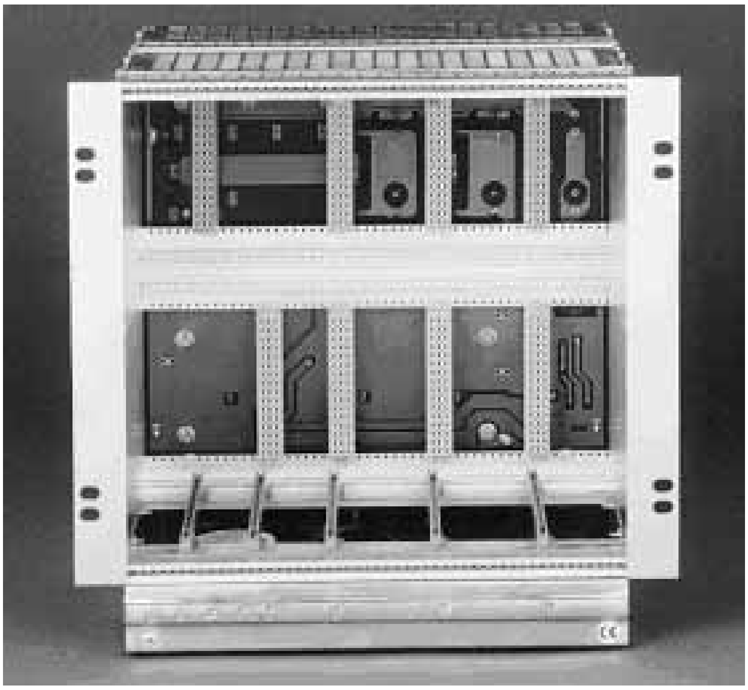
### 5.1.1 Rack and Power Supply

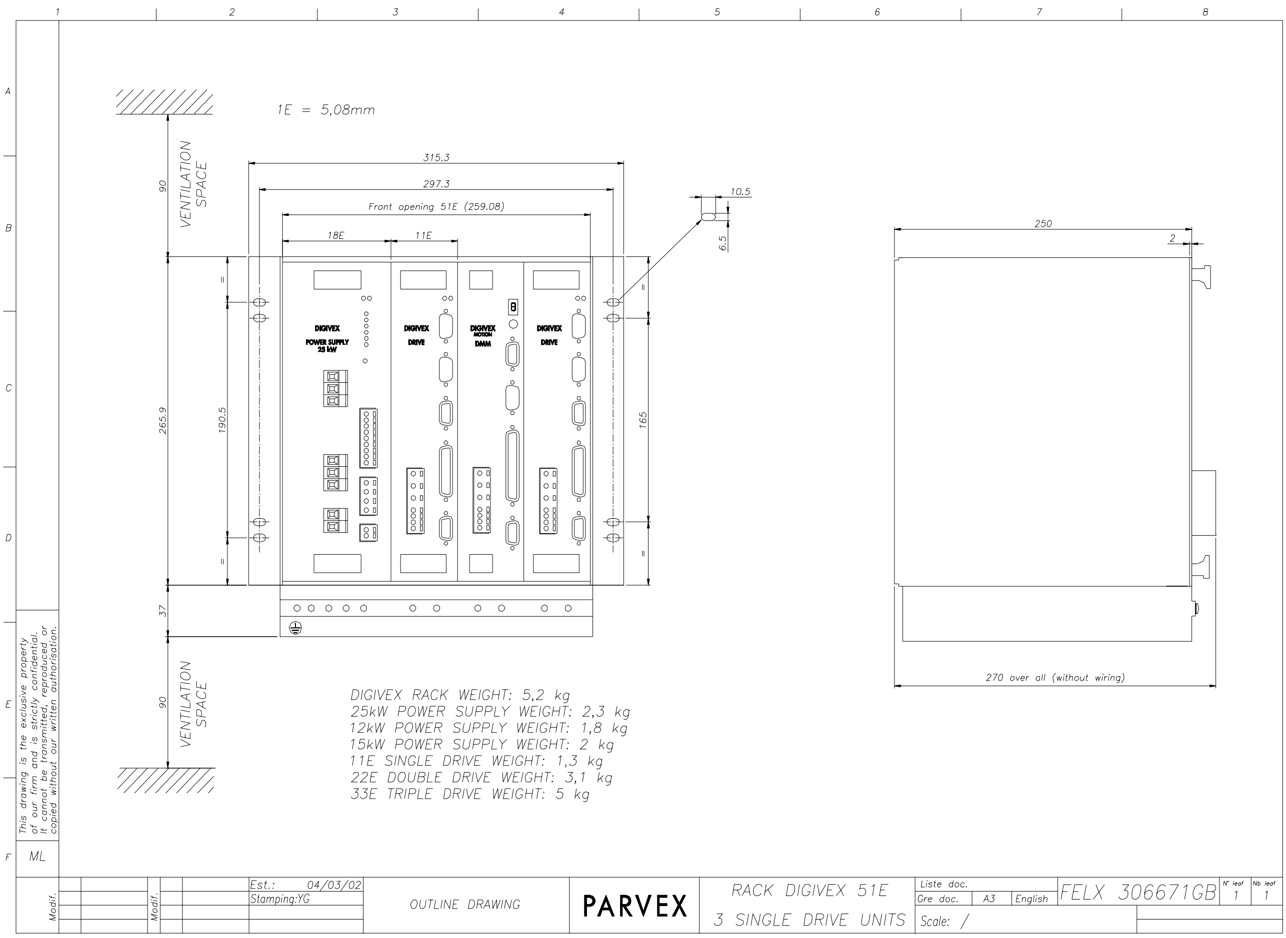
SIX LOCATION SINGLE MODULE RACK





THREE LOCATION SINGLE MODULE RACK





### 5.1.2 DIGIVEX Drive

Double Europe format cards, available in three widths: single, double, triple module.

| DIGIVEX Drive MODULE | 2/4 | 4/8 | 8/16 | 16/ 32 | 32/64 |
|---|---|---|---|---|---|
| | SINGLE | SINGLE | SINGLE | DOUBLE | TRIPLE |

## 5.2 Labels, Codes

### 5.2.1 Racks

Two stickers are affixed to the right-hand side of the rack :

- One shows the serial number and date of manufacture.
- One is equivalent to the specimen stickers below :

DIGIVEX 84E Rack Label
(Six single-module locations)

| CE | RACK DIGIVEX<br>DRA3168V63 |
|---|---|

DIGIVEX 51E Rack Label
(Three single-module locations)

| CE | RACK DIGIVEX<br>DRA3165V43 |
|---|---|

DIGIVEX 84E Rack Label
(13 single-module locations)

| CE | RACK DIGIVEX<br>DRA3128V63 |
|---|---|

Meaning of indications on labels :
. RACK DIGIVEX : Designation
. DRA .......: Rack Code

**Codes**

84Ex2 Racks (13 single module locations)

| CODE (rear fastening) | CODE (front fastening) | FUNCTION |
|---|---|---|
| DRA3128V63 | DRA3128V63L | Standard ventilation and internal resistor |
| DRA3128L63 | DRA3128L63L | Standard reduced ventilation and internal resistor resistor bus |
| DRA3128R43 | DRA3128R43L | Standard ventilation and external resistor |

84E Racks (6 single module locations)

| CODE | FUNCTION |
|---|---|
| DRA3168V63 | Standard ventilation and internal resistor |
| DRA3168V23 | Standard reduced ventilation and internal resistor |
| DRA3168R43 | Standard ventilation and external resistor |

51E Racks (3 single module locations)

| CODE | FUNCTION |
|---|---|
| DRA3165V43 | Standard ventilation and internal resistor |
| DRA3165V23. | Standard reduced ventilation and internal resistor |
| DRA3165R23 | Standard ventilation and external resistor |

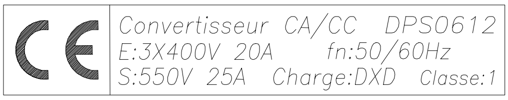
## 5.2.2 Power Supply

Two labels are fastened to the rear connectors of the DIGIVEX Power Supply module:

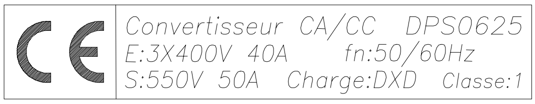
⇒ One shows the serial number and date of manufacture;

⇒ One is equivalent to the specimen stickers shown below

DIGIVEX Power Supply 12kW




DIGIVEX Power Supply 25 kW




Meaning of label indications :

| | |
|---|---|
| - Convertisseur CA/CC | AC / DC converter |
| - DPS ---- | DIGIVEX Power Supply code |
| - E: 3 x 400 V --A | Input voltage and current |
| - fn: 50/60 Hz | Authorised frequency range |
| - S: 550 V -- A | Output voltage and current |
| - Charge: DXD | Type of load (DIGIVEX DRIVE module) |
| - Class: 1 | Service class to standard EN 60146, 1 = permanent |

Codes

DIGIVEX Power Supply

| CODE | FUNCTION |
|---|---|
| DPS0612 | 12 kW DIGIVEX Power Supply |
| DPS0625 | 25 kW DIGIVEX Power Supply |

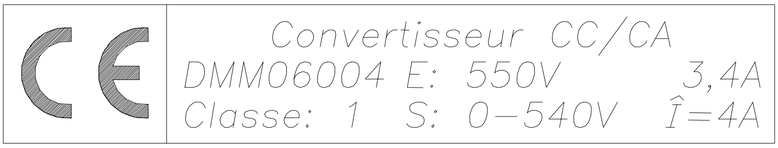
EXTERNAL ENERGY DISSIPATION RESISTORS

| CODE | FUNCTION |
|---|---|
| RE 91001 | 2000 W - 27 Ω resistor |
| RE 91002 | 4500 W - 12 Ω resistor |
| RE 90020 | Pair of wall fastening resistor support |

## 5.2.3 DIGIVEX Drive

Markings affixed to appliance:

- Two labels are affixed to the rear connectors :
  - ∗ one showing the serial number and date of manufacture
  - ∗ one in accordance with the model below.




Meaning of label markings :

| | |
|---|---|
| - Convertisseur CC/CA | : DC/AC converter |
| - DXD---- | : DIGIVEX Drive module code |
| - E: 550 V -- A | : Input voltage and current |
| - Class | : Service class to standard NF EN 60146, 1 = permanent |
| - S: 0-540V -- Â | : Output voltage and permanent output current (peak Amp) |

- One label on the front panel, on the handle, indicating :
  - ∗ DXD module serial number
  - ∗ DXD module code
  - ∗ one line for miscellaneous information

- One label on the EEPROM (subprint SZ 6608B)
  - ∗ DXD module code
  - ∗ corresponding motor
  - ∗ maximum speed (N max.) for a given reference (usually 10 V)

- One label on the EEPROM (marked U47) indicating the software reference (e.g. AP501V3).

The drive customized parameters are stored in this plug-in EEPROM memory. The parameters can be read by :

⇒ DIGIVEX - PC software
⇒ Display / parameter setting terminal (see following sections)

**Codes**

| CODE | FUNCTION |
|---|---|
| DMD06002- | DIGIVEX Drive axis module 2/4 |
| DMD06004- | DIGIVEX Drive axis module 4/8 |
| DMD06008- | DIGIVEX Drive axis module 8/16 |
| DMD06016- | DIGIVEX Drive axis module 16/32 |
| DMD06032- | DIGIVEX Drive axis module 32/64 |

DMMxxxxxC : DMM with CANopen fieldbus interface
DMMxxxxxP : DMM with Profibus fieldbus interface

# 5.3 Accessoires

## 5.3.1 Mains filter

Mains filters: These filters are essential for compliance with protection currently required against interference (see especially the section on compliance with standards and wiring diagrams ). Dimensions are shown on drawing FELX 307020 and 304967 (see following pages).

## 5.3.2 Inductors for long cable lengths with axis motor

Between motor and drive. See § 6.11.2 for choice. See FELX 302983 for dimensions (following pages).

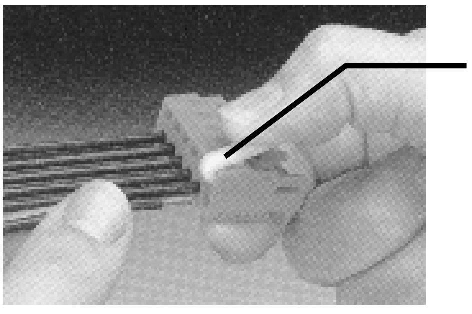
## 5.3.3 External energy dissipation resistors

ENERGY DISSIPATION EXTERNAL RESISTOR (for DIGIVEX Power Supply 25 kW only)

- See Drawing FELX 404537 (next pages)

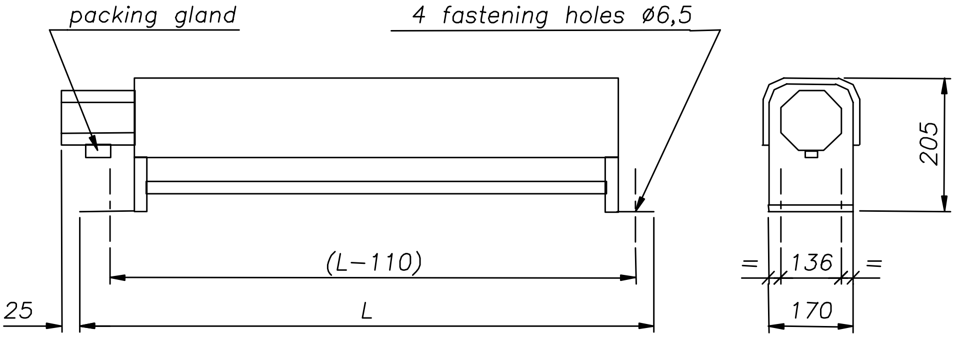
## 5.3.4 Tool

Tool for connecting leads to spring-action terminal blocks (X1, X2, X3). This tool is systematically supplied with the equipment. Extra ones may be ordered as catalogue number Parvex PD 01077.



(tool) lever
PD 01077

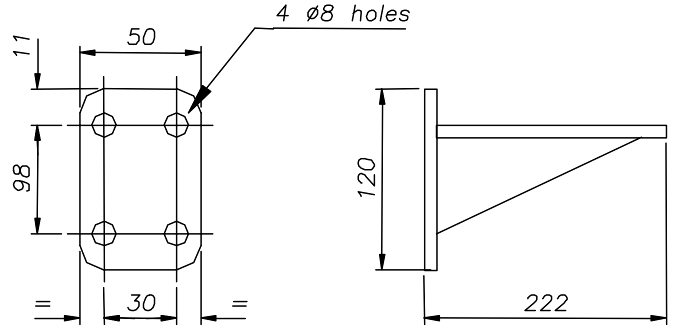
| Position | Text | Identification number | | Weight |
|---|---|---|---|---|
| | DIGIVEX | FELX 404537GB P1 | | |
| | EXTERNAL RESISTOR | | | |




| Standard N° | Power (W) | R (Ω) | L (mm) |
|---|---|---|---|
| RE 91001 | 2000 | 27 | 620 |
| RE 91002 | 4500 | 12 | 1195 |

Connection in IP55 sealed terminal box with packing gland.
Weight (kg) : 1 + 9,2L(m)

RE 90020



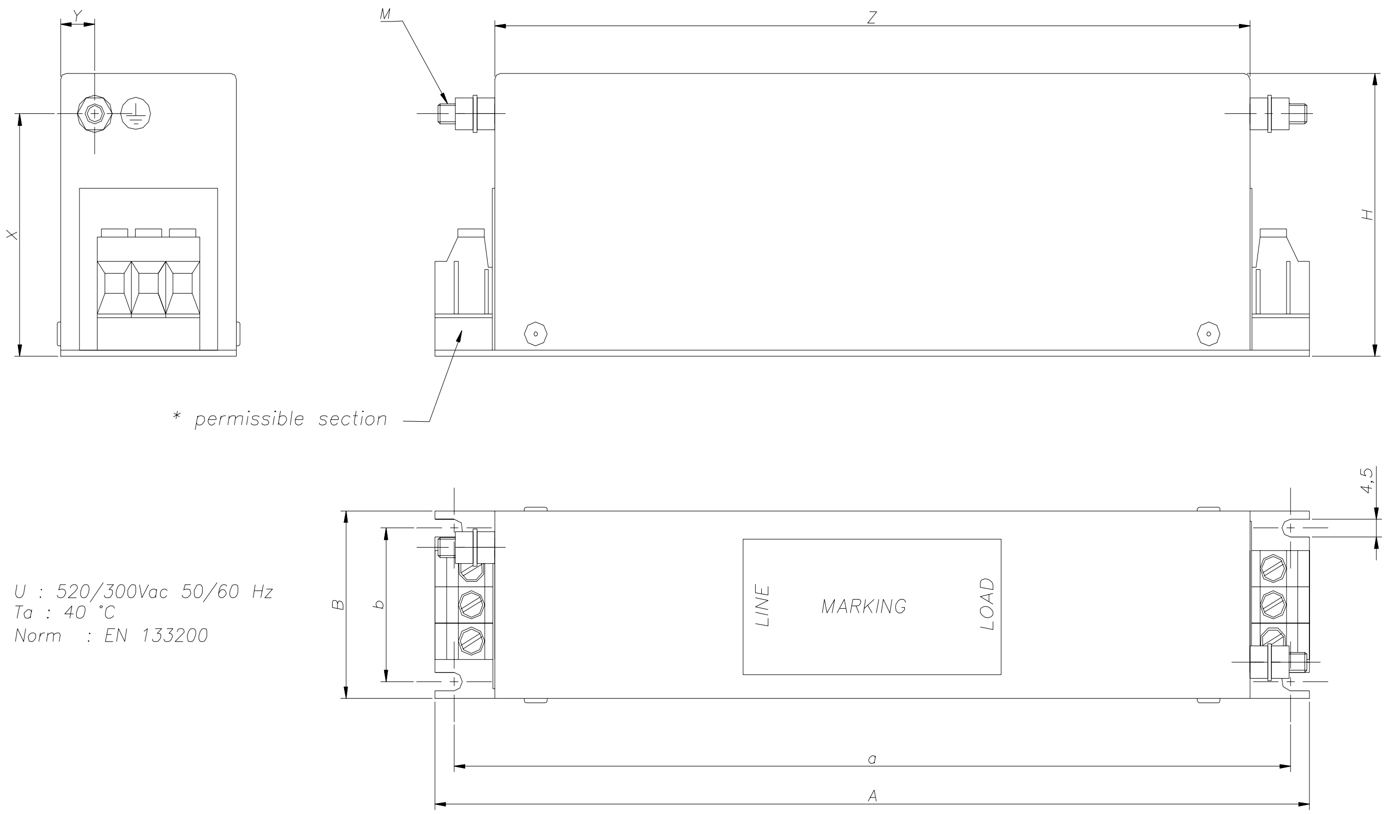

Pair of wall consoles
Weight : 0,9kG

RECOMMENDATION:
These resistors must be used horizontally, fixed to the ground or to wall consoles, with nothing liable to impede natural convection.



| Service | Drawing | 26/07/95 | JP | Stamping | | Order of execution | ML |
|---|---|---|---|---|---|---|---|
| Modifications | A | AM:E98026 – 20/02/98 – VR | | | Scale 1 | Replacing | |
| | | | | | | Separate nomenclature of Nbe dif. | |
| | | | | | | Separate nomenclature of same Nbr | |

| | | | |
|---|---|---|---|
| PARVEX | DIGIVEX | SIZE A4 | Family |
| | | | LEAF N° 1 Nb 1 |
| | EXTERNAL RESISTOR | FELX 404537GB | |

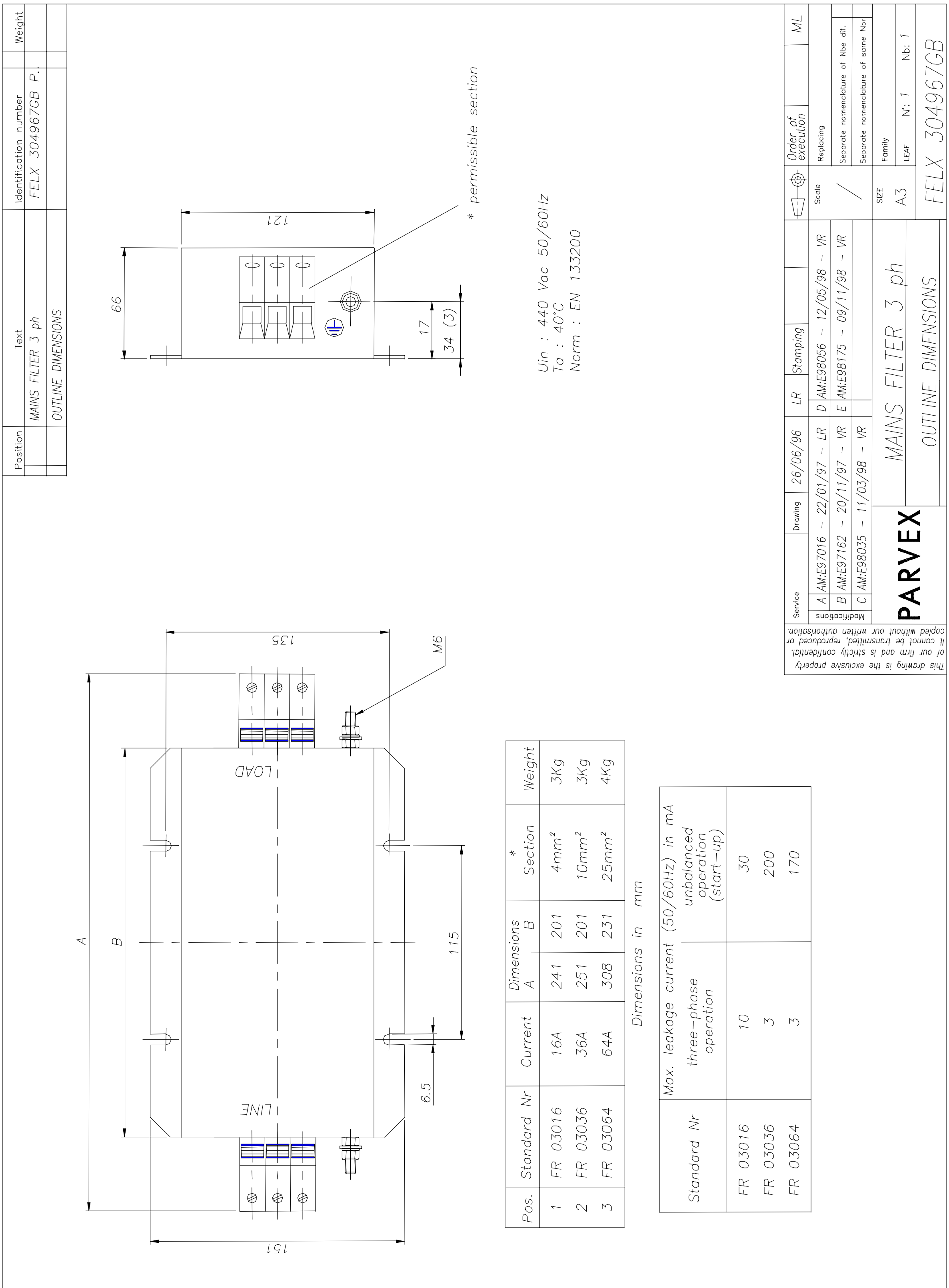



| Pos. | Standard Nr | Current | Max. leakage current (520Vac 50Hz) in mA | Weight | Dimensions A | Dimensions B | Dimensions H | Fixing a x b | X | Y | Z | M | * Section |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | FR 03608 | 8 A | 13 | 0,58 kg | 165 | 51,4 | 63 | 155 x 38 | 50 | 8 | 133,7 | M4x11 | 4mm² |
| 2 | FR 03616 | 16 A | 15 | 0,90 kg | 231 | 46,4 | 70 | 221 x 38 | 60 | 9 | 199,5 | M5x15 | 4mm² |
| 3 | FR 03636 | 36 A | 15 | 1,75 kg | 265 | 58 | 90 | 255 x 35 | 70 | 8 | 200 | M6x24 | 10mm² |

DIMENSIONS IN mm



Modif. | Modif. | Est.: 08/12/03 | Stamping:YG | DIMENSIONS | PARVEX | MAINS FILTER 3PH "BOOK-SIZED" | Liste doc. | Gre doc. A3 English | Scale: / | FELX 307020GB | N° leaf 1 | Nb leaf 1

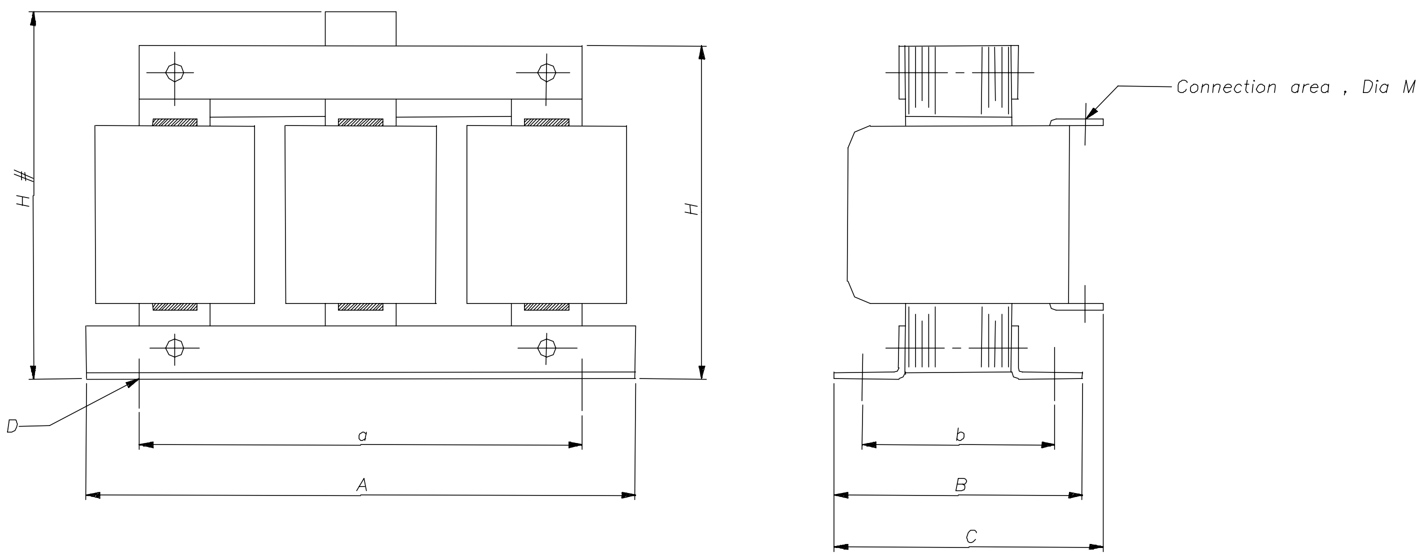



| Pos. | Standard Nr | Current | Dimensions A | Dimensions B | * Section | Weight |
|---|---|---|---|---|---|---|
| 1 | FR 03016 | 16A | 241 | 201 | 4mm² | 3Kg |
| 2 | FR 03036 | 36A | 251 | 201 | 10mm² | 3Kg |
| 3 | FR 03064 | 64A | 308 | 231 | 25mm² | 4Kg |

Dimensions in mm

| Standard Nr | Max. leakage current (50/60Hz) in mA: three-phase operation | Max. leakage current (50/60Hz) in mA: unbalanced operation (start-up) |
|---|---|---|
| FR 03016 | 10 | 30 |
| FR 03036 | 3 | 200 |
| FR 03064 | 3 | 170 |

| Position | Text | Identification number | | Weight |
|---|---|---|---|---|
| | THREE PHASE CHOKE | FELX 302983GB | | |
| | DIMENSIONS | | | |




| No Standard | Ct nom. | Choke nom. | Dimensions A | B | C | H | H# | Fixing axb | D | connection area | M | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SF 02025 | 26A | 850uH | 150 | 95 | 110 | / | 135 | 112x80 | 6 | # 6mm2 | / | 4,5kg |
| SF 02026 | 65A | 340uH | 175 | 95 | 95 | 165 | 180 | 53x68 | 6,5 | 16x16 | 6,5 | 9Kg |
| SF 02027 | 118A | 190uH | 290 | 116 | 135 | 210 | / | 230x100 | 8 | 20x20 | 9 | 13Kg |
| SF 02028 | 17A | 1,3mH | 160 | 95 | / | / | 115 | 112x71 | 6 | # 6mm2 | / | 4,2Kg |
| SF 02029 | 91A | 245uH | 220 | 135 | 160 | 160 | / | 166x114 | 6 | 20x20 | 9 | 15Kg |
| SF 02030 | 170A | 130uH | 235 | 120 | 165 | 240 | / | 185x100 | 9 | 25x28 | 11 | 19Kg |
| SF 02032 | 7,5A | 400uH | 132 | 75 | 85 | / | 103 | 94x55 | 6x10 | # 4mm2 | / | 1,9Kg |

The dimensions are in mm

# TERMINAL BLOCK CONNECTION



Service | Drawing 05/02/91 | FM | Stamping | Order of execution | ML

Modifications:
- A 17/12/92 – AJOUT SF 02032
- B 24/02/97 – MISE A JOUR
- C AM:E98035 – 11/03/98 – VR

Scale / | Replacing | Separate nomenclature of Nbe dif. | Separate nomenclature of same Nbr

PARVEX

THREE PHASE CHOKE

DIMENSIONS

SIZE A3 | Family | LEAF N° 1 Nb 1

FELX 302983GB

# 6. ELECTRICAL CONNECTIONS

## 6.1 General Wiring Requirements

### 6.1.1 Appliance handling

See the safety instructions given at the beginning of this manual. In particular, wait for all the front panel LEDs to go off completely before doing any work on the servo-amplifier or servomotor.

Do not remove or fit the modules while the power is on.

While the power is on do not connect or disconnect :

- the power connectors.
- the resolver and encoder emulation connections.

### 6.1.2 Electromagnetic compatibility

EARTHING

- Comply with all local safety regulations concerning earthing.
- Utilize a metal surface as an earth reference plane (e.g. cabinet wall or assembly grid). This conducting surface is termed the potential reference plate. All the equipment of an electrical drive system is connected up to this potential reference plate by a low impedance (or short distance) link. Ensure the connections provide good electrical conduction by scraping off any surface paint and using fan washers. The drive will then be earthed via a low impedance link between the potential reference plate and the earth screw at the back of the DSM. If this link exceeds 30 cm, a flat braid should be used instead of a conventional lead.

CONNECTIONS

- Do not run low-level cables (resolver, inputs/outputs, NC or PC links) alongside what are termed power cables (power supply or motor). Do not run the power supply cable and the motor cables alongside one another otherwise mains filter attenuation will be lost. These cables should be spaced at least 10 cm apart and should never cross, or only at right-angles.
- Except for the resolver signals, all low-level signals will be shielded with the shielding connected at both ends. At the DSM end, the shielding is made continuous by the Sub-D connector mechanism.
- The motor cables are limited to the minimum functional length. The yellow and green motor cable lead must be connected to the box or front panel terminal block with the shortest possible link.
- This usually means shielded motor cable is not required. Chokes may also be inserted into the motor phase leads.

MAINS FILTERING

The equipment complies with standard EN55011 with a filter on the power input with minimum 60 dB attenuation in the 150 kHz - 30 MHz range.

The mains filter must be mounted as close as possible to the potential reference plate between the mains and the DSM power supply. Use shielded cable (or run the cable in metal trunking). Avoid running cables together, ahead of and after the filter.

Filters sometimes have high leakage currents. In this case, comply with the standard connection diagrams when fitting them.

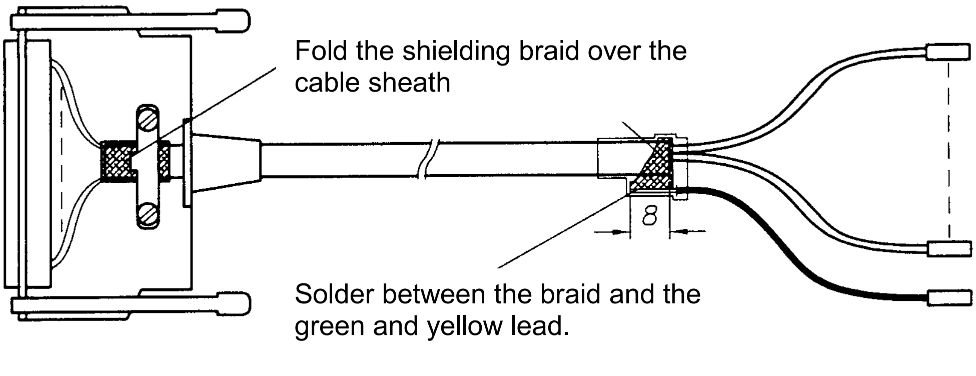
OTHER MEASURES

Self-inducting components must be protected against interference: brakes, contactor or relay coils, fans, electro-magnets, etc.

### 6.1.3 DIGIVEX MOTION Sub-D connectors

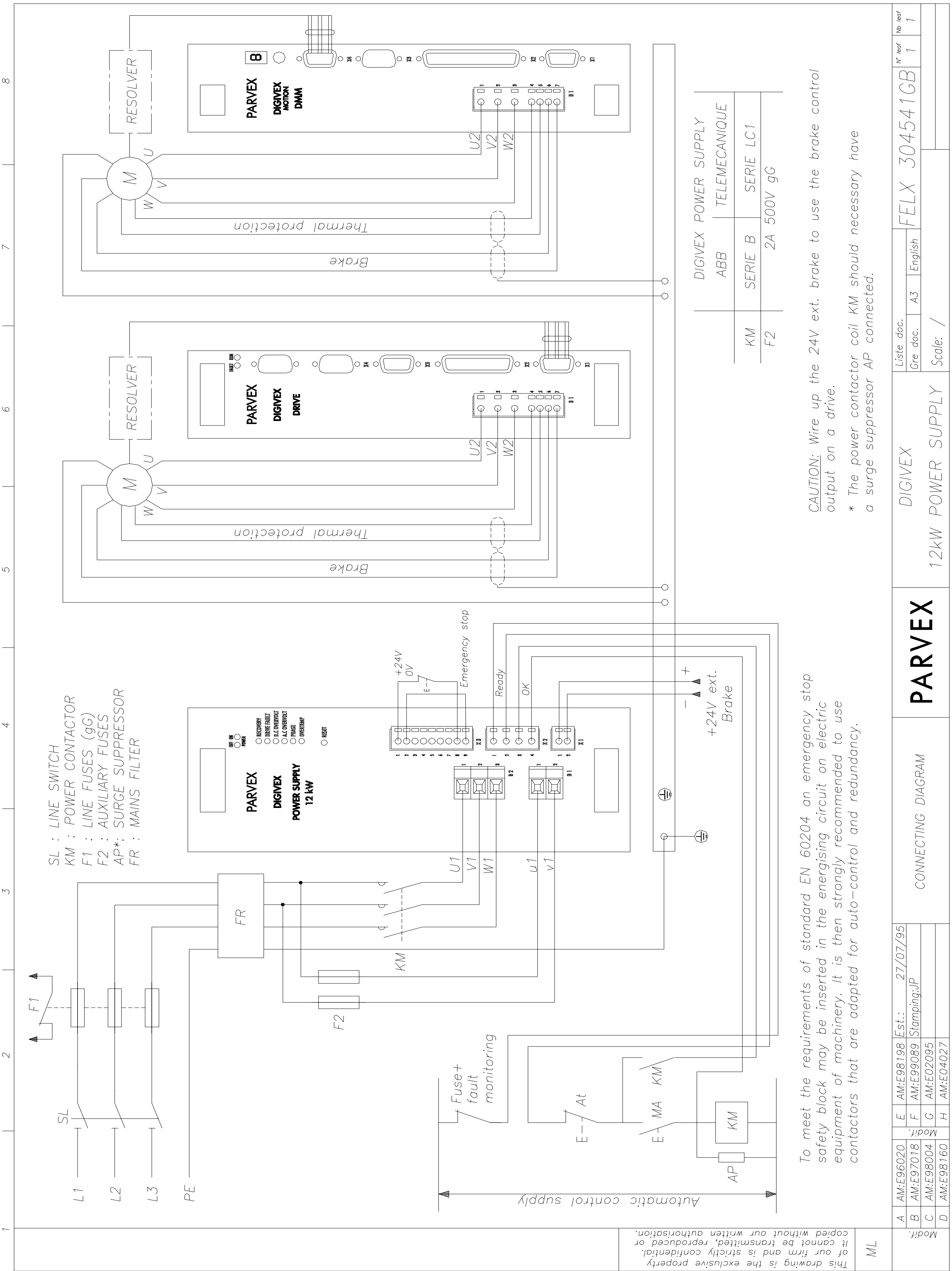
In order to ensure the system is free from disturbances, it is essential for the rack to be properly connected to the earth plane of the electrical cabinet and for the covers of the Sub-D connectors to be EMI/RFI shielded (metal with shielding braid connection).
Make sure the Sub-D connectors and their covers are properly connected (lock screws fully tight).

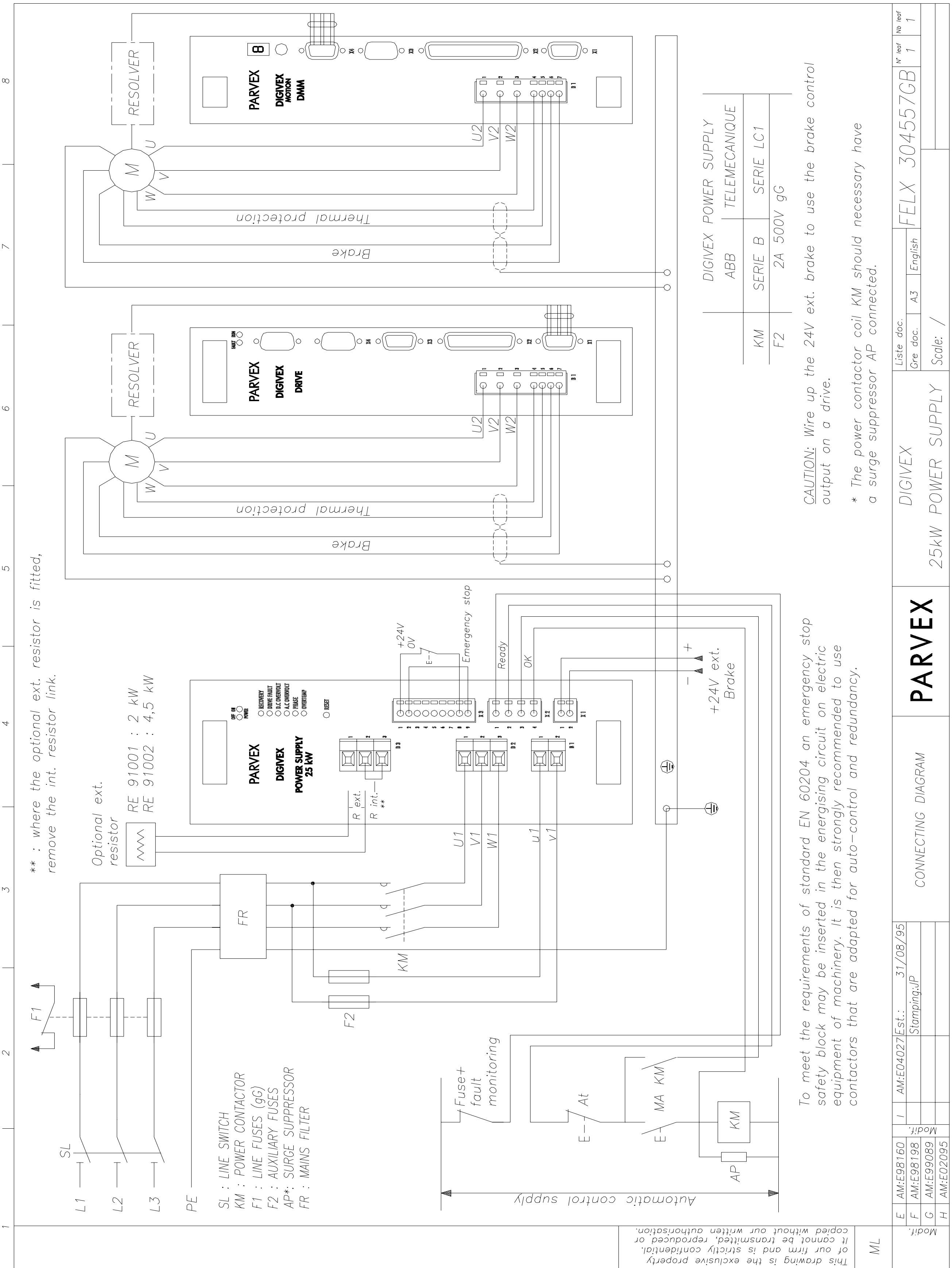
GROUND CONNECTION




## 6.2 Typical Connection Diagram

See drawings FELX 304541GB and FELX 304557GB below.


SL : LINE SWITCH
KM : POWER CONTACTOR
F1 : LINE FUSES (gG)
F2 : AUXILIARY FUSES
AP*: SURGE SUPPRESSOR
FR : MAINS FILTER
DIGIVEX POWER SUPPLY
ABB | TELEMECANIQUE
KM | SERIE B | SERIE LC1
F2 | 2A 500V gG
CAUTION: Wire up the 24V ext. brake to use the brake control output on a drive.
* The power contactor coil KM should necessary have a surge suppressor AP connected.
To meet the requirements of standard EN 60204 an emergency stop safety block may be inserted in the energising circuit on electric equipment of machinery. It is then strongly recommended to use contactors that are adapted for auto-control and redundancy.
Automatic control supply
Thermal protection
Brake
RESOLVER
PARVEX
DIGIVEX POWER SUPPLY 12 kW
DIGIVEX DRIVE
DIGIVEX MOTION DMM
Emergency stop
Ready
OK
+24V ext. Brake
Fuse+ fault monitoring
CONNECTING DIAGRAM
DIGIVEX 12kW POWER SUPPLY
FELX 304541GB
This drawing is the exclusive property of our firm and is strictly confidential. It cannot be transmitted, reproduced or copied without our written authorisation.



RESOLVER
PARVEX
DIGIVEX MOTION
DMM
DIGIVEX DRIVE
U2
V2
W2
Thermal protection
Brake
** : where the optional ext. resistor is fitted,
remove the int. resistor link.
Optional ext. resistor
RE 91001 : 2 kW
RE 91002 : 4,5 kW
DIGIVEX POWER SUPPLY 25 kW
+24V
0V
Emergency stop
Ready
OK
+24V ext. Brake
U1
V1
W1
u1
v1
FR
KM
F1
F2
SL
L1
L2
L3
PE
SL : LINE SWITCH
KM : POWER CONTACTOR
F1 : LINE FUSES (gG)
F2 : AUXILIARY FUSES
AP*: SURGE SUPPRESSOR
FR : MAINS FILTER
Fuse+ fault monitoring
At
MA
AP
Automatic control supply
To meet the requirements of standard EN 60204 an emergency stop
safety block may be inserted in the energising circuit on electric
equipment of machinery. It is then strongly recommended to use
contactors that are adapted for auto-control and redundancy.
DIGIVEX POWER SUPPLY
ABB | TELEMECANIQUE
KM | SERIE B | SERIE LC1
F2 | 2A 500V gG
CAUTION: Wire up the 24V ext. brake to use the brake control
output on a drive.
* The power contactor coil KM should necessary have
a surge suppressor AP connected.
This drawing is the exclusive property
of our firm and is strictly confidential.
It cannot be transmitted, reproduced or
copied without our written authorisation.
CONNECTING DIAGRAM
DIGIVEX
25kW POWER SUPPLY
FELX 304557GB
Scale: /

### 6.2.1 Surge Suppressor

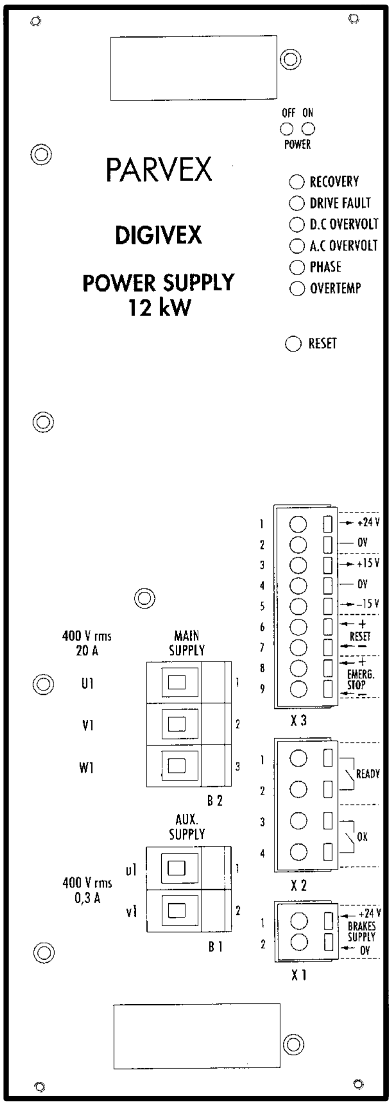
- KM: Power Contactor
- AP: Surge Suppressor

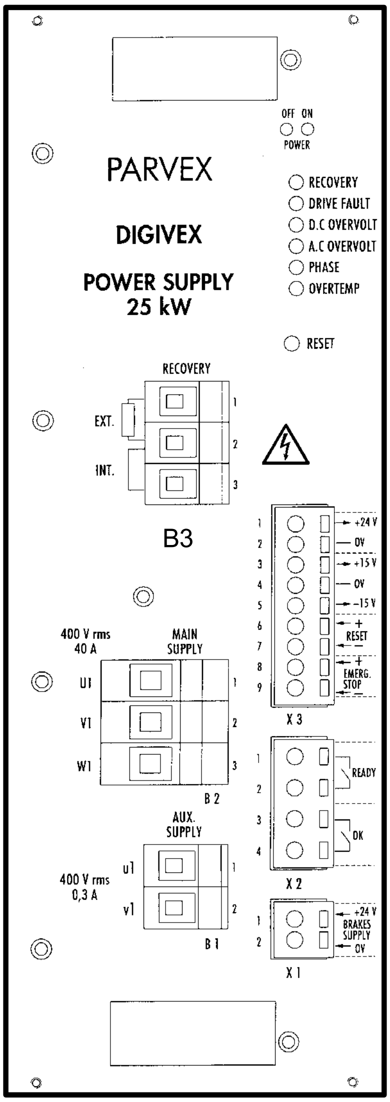
The power contactor coil KM should **necessary** have a surge suppressor AP connected in order not to destroy prematurely the internal relay contact of the drive. This module should be use whether the power contactor supply is AC or DC.

The relay manufacturers (Telemecanique: LC1 series, ABB: B series,…) provide surge suppressors fitted relays wether the power contactor supply is AC or DC for various voltages (RC module, Diode+Zener Diode, Varistor,…).

# 6.3 Power Supply connection

## 6.3.1 Front panel terminal blocks




All the connections are brought to the front panel :

- B1 : "Auxiliary" power supply (low level)
- B2 : Mains input
- B3 (on 25 kW DIGIVEX Power Supply): external resistor
- X1 : 24V power supply for brake
- X2 : main contactor automatic control interface
- X3 : 24V, +/-15V outputs, Reset and zero speed setting

### 6.3.2 Terminal block characteristics

Recap showing for terminal blocks B1, B2, B3, X1, X2 and X3 (DIGIVEX Power Supply) :

- terminal type.
- maximum permissible cable cross-section (S) for the terminal block.
- recommended torque value (T) for the terminal block.

| TERMINAL | 12 kW POWER SUPPLY | 25 kW POWER SUPPLY |
|---|---|---|
| B1 | screw-type, S = 4 mm² flexible wire<br>S = 6 mm² rigid wire, T = 0.8 Nm | screw-type, S = 4 mm² flexible wire<br>S = 6 mm² rigid wire, T = 0.8 Nm |
| B2 | screw-type, S = 6 mm² flexible wire<br>S = 10 mm² rigid wire, T = 1.8 Nm | screw-type, S = 6 mm² flexible wire<br>S = 10 mm² rigid wire, T = 1.8 Nm |
| B3 | - | screw-type, S = 4 mm² flexible wire<br>S = 6 mm² rigid wire, T = 0.8 Nm |
| X1 à X3 | spring-type, S = 2.5 mm≤ | spring-type, S = 2.5 mm≤ |

### 6.3.3 Power component dimensions

Applicable to components ahead of the DIGIVEX POWER SUPPLY (fuses, cables, contactor, etc.), dimensions depend on :

- permanent currents (sinusoidal peak) at low speed of each motor as shown in characteristics ($\hat{I}_0$).
- the drive simultaneity coefficient.

Supposing this coefficient is equal to 1 and cosφ= 1, gives :

$$P \text{ mains} \cong 1.1 \text{ U rms } \Sigma \hat{I}_0$$

$$\text{Irms mains} = \frac{P}{\text{Urms}.\sqrt{3}}$$

| MAINS INPUT POWER 400 V<br>kW | $\Sigma \hat{I}_0$<br>Â | LINE CURRENT for mains Urms = 400 V<br>A eff. | FUSE RATING<br>Type gG | MAINS FILTER<br>" Book-Sized " | MAINS FILTER |
|---|---|---|---|---|---|
| 4.4 | 10 | 6.5 | 10 | FR03616 | FR03016 |
| 6.6 | 15 | 9.5 | 16 | | |
| 13.2 | 30 | 19 | 32 | FR03636 | FR03036 |
| 24.2 | 55 | 36 | 50/63 | | |

The cable cross-section and contactor rating must be selected accordingly.

## 6.3.4 Connection to mains

**Terminal block B2.**

400 V rms three-phase mains supply via terminal block B2 : **terminals U1 - V1 - W1**
Single-phase operations possible (downgraded mode, please ask for details).

## 6.3.5 Low-Level and Auxiliary Supply

**Terminal block B1.**

Each DIGIVEX Drive derives its low-level supply from a low-level supply bus and restores the ± 15 V / 5 V it requires through a chopper supply and transformer.

The « low-level supply » bus, whose voltage is between 200 V and 750 V, may be obtained in either of two ways :
⇒ either via terminal block B1, from a single-phase source, which may be :

- 400 V single-phase, from 48 to 62 Hz between two phases ahead of the main switch;
- a separate 400 V source. In this case **a 200 VA isolating transformer must be provided** (e.g. primary 230 V ± 10%, secondary 400 V ± 10%)

The advantage with these solutions is that the power part can be cut out separately while the LED fault display and the encoder emulation counting capability are maintained.

⇒ Or from the power bus. In this case only terminal block B2 need be connected.

**Drawback :** If power fails, regulation supply and above all any encoder emulation card information is lost.

Internal fuse :

- Marked F1, protects the chopped supply : type 500V / 1.6A

Auxiliary supply monitoring, supply present.

- Auxiliary supply also provides 24 V dc for the rack fans, and the rack is therefore fan-cooled as long as the low-level supply is maintained.

Low-level consumption: 30 W.

## 6.3.6 External Energy Dissipation Resistor

For 25 kW DIGIVEX POWER SUPPLY with external resistor option :

- No link between terminals 2 and 3 of terminal block B3.
- The resistor is connected between terminal 2 and 3 of terminal block B3.

Maximum current in cable :

- With RE 91001 (2 000 W) : 30 A
- With RE 91002 (4 500 W) : 60 A

Cable type: unshielded, cross-section 2.5 mm² for 2 000 W, 4 mm² for 4 500 W.
Maximum recommended distance : 10 m.
Resistor end: connection by terminal box through packing gland PG 16 for 10 mm - 14 mm diameter cable.

## 6.3.7 Control signal connection (terminal Blocks X2 and X3)

Plug-in terminals

| **TERMINAL BLOCK** X2 | | |
|---|---|---|
| 1 - 2<br><br>3 - 4 | Output<br><br>Output | « READY » contact<br><br>« OK » contact<br><br>Potential free contacts<br>Max. U = 250 V I =1A<br>Cut-out power = 250 VA<br>(ohmic load) |

**- X2/1.2 : Ready Contact**

The contact is closed if :

- the auxiliary bus (low-level) is correct, >290 V dc on powering up,
- at least one drive is in the rack,
- drives signalled no faults when low-level supplies appeared.

This contact authorises the main switch to be closed

- the red POWER OFF LED glows.

**- X2/3.4 : OK Contact**

The contact is closed if :

- AUX. supply is correct,
- power supply is present (>200 V dc)
- the low-level and power drives signal no faults.

The contact authorises the main switch to be self-maintained

- the green POWER ON LED glows.

**CAUTION** : Opening the OK contact must cause the main contactor to open with a max 100 ms delay.

| TERMINAL BLOCK X3 | | |
|---|---|---|
| 1 | Output | 24 V regulated |
| 2 | Output | 0V of 24 V |
| 3 | Output | 15 V regulated |
| 4 | Output | 0 V of ±15 V |
| 5 | Output | -15 V regulated |
| 6 | Input | + Reset |
| 7 | Input | - Reset |
| 8 | Input | + Emergency Stop |
| 9 | Input | - Emergency |

**- X3/1 24 V regulated**

**- X3/2 0 V of 24 V**

- Max. 24 V - 50 mA power supply. **Do not use for brake supply**.
- Protection against overloads and short circuits by resettable fuse.

This supply is for logic inputs but is also used internally for the fan power supply. There is no common point with the metal case.

**- X3/3 +15 V regulated**

**-X3/4 0 V of 15 V**

**- X3/5 -15 V regulated**

- max. ±15 V - 10 mA power supply.
- Protected by 47 Ω resistor.

This supply is common with the internal supply of the POWER SUPPLY module. There is no common point with the metal casing.

**- X3/6 to X3/9 Logic inputs**
Common characteristics:

- 24 V dc optocoupled inputs (insulation voltage 1 kV)
- type two inputs to IEC 1131-2.

These inputs may be connected directly to PNP type outputs (external load resistor not required).

| | MIN. | TYPICAL | MAX. |
|---|---|---|---|
| Level 0 input voltage | - | 0V | 5V |
| Level 1 input voltage | 11V | 24V | 30V |
| Level 0 input current | - | 0mA | 2mA |
| Level 1 input current | 7mA | 13mA | 15mA |
| Response time Ton (0 to 1) | - | 1ms | - |
| Response time Toff (1 to 0) | - | 1ms | - |

**- X3/6 Reset + (24V DC logic input)**
**- X3/7 Reset – (0V)**

A 24 V rising edge applied across X3/6 compared with X3/7 resets the system after a power supply or drive fault (clear).
Note that the front panel reset button can also be used, or turning off the power completely (power and auxiliaries).
This control has no effect during normal operation.

**- X3/8 and X3/9 Emergency Stop , in speed loop mode only**
A 24 V source must be applied between terminals X3/8 (+) and X3/9 (-) to enable drive operation: the 24 V may be taken from X3 terminals 1 and 2.

The collapse of 24 V across terminals X3/8 and X3/9 acts on all the drives causing dynamic braking. This is an aid for category 1 or 2 stops to standard EN 60204.

## 6.3.8 Terminal Block X1 "Brake Supply"

Plug-in terminal block.
This terminal block can accommodate a 24 V power supply for brakes fitted to motors. It is redistributed by the drives to the motor power terminal blocks.
Regulated / filtered 24 V ± 10% voltage - Overload protection by 26 Joule varistance. This protection is operational from 30 V.

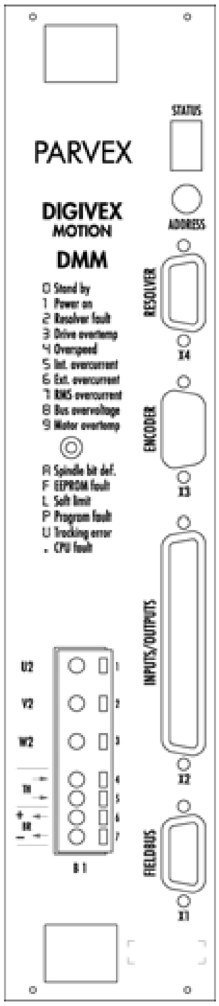
# 6.4 DIGIVEX Drive connection

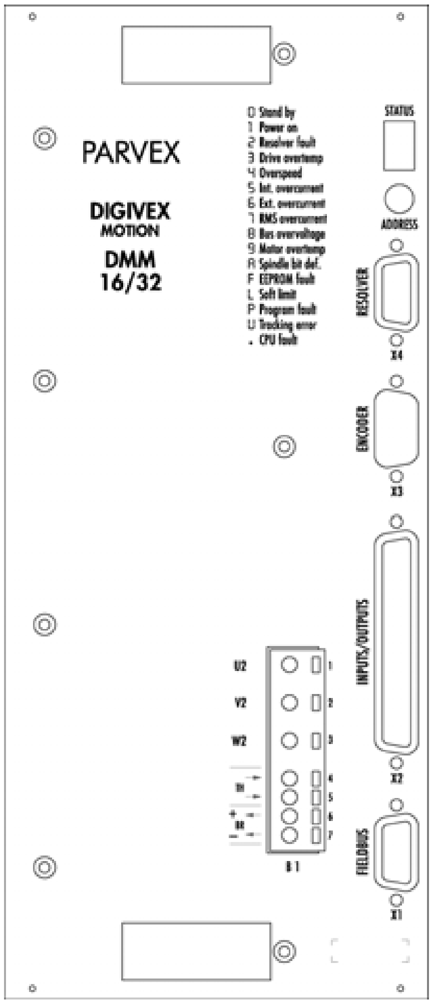
## 6.4.1 Front panel terminal blocks

### 6.4.1.1 DIGIVEX Drive calibres 2/4, 4/8, 8/16 and 16/32

**Terminal Blocks B1 : Power, Thermal Protection and Brake**

- One plug-in terminal block B1 comprising :
  - ♦ terminals 1, 2 and 3 marked U2, V2 and W2 for power.
  - ♦ terminals 4 and 5 for motor thermal protection (TH) input (current less than 3 mA).
  - ♦ terminals 6 and 7, 24 V for brake supply (BR).

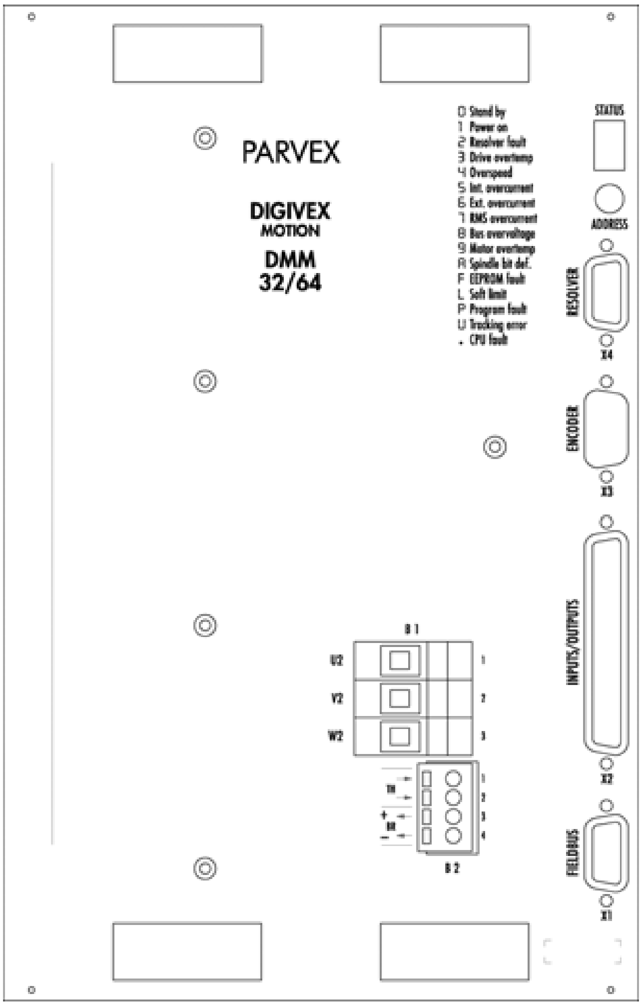


### 6.4.1.2 DIGIVEX Drive calibre 32/64

**Terminal Blocks B1/B2: Power, Thermal Protection and Brake**

- One fixed terminal block B1 (screw terminals), terminals 1, 2 and 3 (U2, V2, W2) for power.
- One plug-in terminal block B2 comprising :
  - ♦ terminals 1 and 2 for motor thermal protection (TH) input (current less than 3 mA).
  - ♦ terminals 3 and 4 (marked Br+ and -) 24 V for braking supply (BR).



### 6.4.2 Terminal block characteristics

Recap showing for terminal blocks B1, B2, B3, X1, X2 and X3 (DIGIVEX Power Supply) :

- terminal type.
- maximum permissible cable cross-section (S) for the terminal block.
- recommended torque value (T) for the terminal block.

| TERMINAL | 12 kW POWER SUPPLY | 25 kW POWER SUPPLY |
|---|---|---|
| B1 | screw-type, S = 4 mm² flexible wire<br>S = 6 mm² rigid wire, T = 0.8 Nm | screw-type, S = 4 mm² flexible wire<br>S = 6 mm² rigid wire, T = 0.8 Nm |
| B2 | screw-type, S = 6 mm² flexible wire<br>S = 10 mm² rigid wire, T = 1.8 Nm | screw-type, S = 6 mm² flexible wire<br>S = 10 mm² rigid wire, T = 1.8 Nm |

Connectors with metal-plated or metallic covers.

| ITEM REF. | CONNECTOR TYPE (cable end) | FUNCTION | MAX. CONDUCTOR CROSS-SECTION |
|---|---|---|---|
| X1 FIELDBUS | 9-pin plug for soldering | Fieldbus connection | max. 0.5 mm² on soldering barrel |
| X2 INPUTS/ OUTPUTS | 37-pin plug for soldering | Logic and analog inputs / output | max. 0.5 mm² on soldering barrel |
| X3 ENCODER | 9-pin plug if encoder emulator output | Encoder emulation output (option) | max. 0.5 mm² on soldering barrel |
| | 9-pin socket for soldering | Incremental encoder input | |
| X4 RESOLVER | 9-pin socket for soldering | Resolver link | max. 0.5 mm² on soldering barrel |

The motor earth is to be connected to the Faston earth lug on the appliance. The SUB-D plugs used must be metal-coated (or metal) and provide continuous shielding through to the appliance's metal earth.

### 6.4.3 Description of 7-segment display and LEDs

A 7-segment "STATUS" display shows the drive operating status.
Fault descriptions are given in Section 7.3.

### 6.4.4 Rotary mini-switch setting (ADDRESS)

Each appliance in the same network CAN or Profibus must have a different subscriber number.

A rotating, 16-position, mini-switch is used to define the number of the appliance.

For information:

| | |
|---|---|
| 0 | Prohibited |
| 1 | 1* |
| 2 | 2* |
| 3 | 3 |
| .<br>.<br>.<br>. | .<br>.<br>.<br>. |
| A | 10 |
| B | 11 |
| C | 12 |
| D | 13 |
| E | 14 |
| F | 15 |

* The “1” and “2” addresses are prohibited to the Profibus bus

The subscriber code may be extended. Please ask for details.

**Attention!** For a subscriber number change to be acknowledged, the appliance must be switched off completely for a few seconds.

# 6.5 Motor connection

## 6.5.1 Motor Power connection

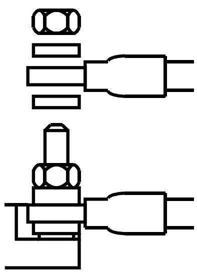
There are two possibilities for connection:

- Terminal block + resolver connector.
- Power connector + resolver connector.

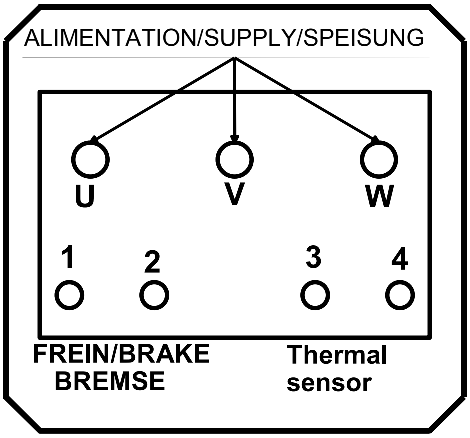
## 6.5.2 Terminal block connection

For the terminal block, the clamping nuts and washer come in a bag
Take care when fitting the lugs not to loosen the connecting leads between the motor and the terminal block.

The power connection lugs are to be inserted between the striated washer and the flat washer.



**Motor direction of rotation:** by wiring as recommended, a positive set point applied to the drive entails clockwise rotation (viewed from the power shaft end).




U Phase U

V Phase V

W Phase W

1 Optional brake +24 V

cable ≥ 1mm²

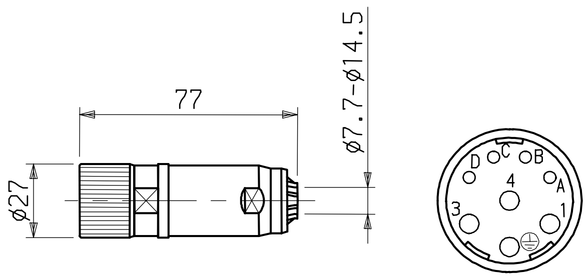
2 Optional brake 0 V

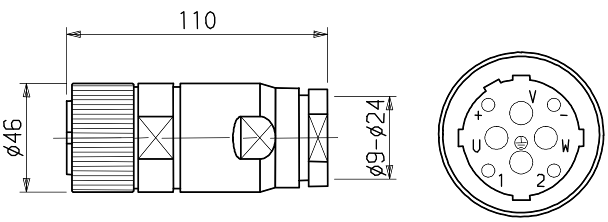
3 Thermal sensor

cable ≥ 1mm²

4 Thermal sensor

### 6.5.3 Power connector connection




PLUG 220065R1610/1611

PLUG 220065R3610/3611

PERMISSIBLE CABLE CROSS-SECTION FOR PLUGS

PLUG 220065R1610: Power & Ground: 0.14 - 1.5 mm². Brake & thermal protection: 0.14 - 1 mm².
PLUG 220065R1611: Power & Ground: 0.75 - 2.5 mm². Brake & thermal protection: 0.14 - 1 mm².
PLUG 220065R3611: Power & Ground: 1.5 - 4 mm². Brake & thermal protection: 1 - 2.5 mm².
PLUG 220065R3610: Power & Ground: 6 - 16 mm². Brake & thermal protection: 1 - 2.5 mm².

| | PIN OUT | | |
|---|---|---|---|
| FUNCTION | 220065R1610/R1611 | 220065R3610 | CABLE COLOUR |
| BRAKE + | A | **+** | Green/Rred |
| BRAKE **-** | B | **-** | Green/Blue |
| THERMAL PROT. | C | 1 | Orange |
| THERMAL PROT. | D | 2 | Yellow |
| GROUND | 2 | ⏚ | Green/Yellow |
| $U_2$ | 1 | U | Black |
| $V_2$ | 4 | V | White |
| $W_2$ | 3 | W | Red |
| Shielding to be connected to the earth at the servoamplifier end ⏚ | | | Green/Orange |

## 6.5.4 <u>"POWER" Cable Definition</u>

The power/drive connector cables must have as a minimum requirement :

- Three insulated conductors connected to U, V, W phases. Cross-sections as in the table below. The internal chokes of the DIGIVEX Drive mean that, as a general rule, there is no need to use shielding on the three power conductors.
- one ground conductor (green/yellow).
- two shielded twisted pairs for connection of the motor thermal protection. Cross-section of about 1 mm².
- two shielded twisted pairs for connection of the holding brake (if fitted). Cross-section of about 1 mm².
- 1 " shielding continuity " conductor (green/orange) to be connected to the servoamplifier earth ⏚

**Power cable cross-section**

Cable cross-sections shown in the table below make allowance for :

- rated drive current;
- motor/drive distance, loss in useful voltage = RI.
- ambient temperature, cable loss of Joules = $RI^2$.
- standardised increase of cable cross-sections.

PARVEX proposes cables for distance of up to 50 m and ambient temperatures of less than 40° C.

| Distance → | 0m | 50m | 100m | 200m |
|---|---|---|---|---|
| DIGIVEX Calibre | Cable cross-section in mm≤ | | | |
| 2/4 and 4/8 | 0.5 | 1 | 2.5 | |
| 8/16 | 1 | 2.5 | 6* | |
| 16/32 | 2.5 | 6* | 10* | |
| 32/64 | 6 | 10* | 16* | |

* Cross-sections incompatible with DIGIVEX DRIVE power terminal blocks (See § 3.4.2).
Fit an intermediate terminal block close to the DIGIVEX DRIVE.

**Power Connection**

**List of power cables, power connectors, and equipped cables for NX, H or L series motors**

| MOTOR | Cable cross-section (mm²) | Power Câble | Power Plug (1) | Equipped Cable |
|---|---|---|---|---|
| **NX1-NX2**<br>Molex connector | 1 | 6537P0023 | 220004R1000 | 220154R12xx |
| **NX1-NX2**<br>Heavy-duty connector | 1 | 6537P0023 | 220065R1610 | 220154R32xx |
| | | | | |
| **NX3-NX4-NX6-NX8**<br>**HX2-HX3-HX4**<br>**LX2-LX3-LX4**<br>**HS-HD-HX6/HS8**<br>**LS-LD-LX6/LS8** | 0,5 | 6537P0019 | 220065R1610 | 220049R49xx |
| | 1 | 6537P0009 | 220065R1610 | 220049R42xx |
| | 2,5 | 6537P0010 | 220065R1611 | 220049R43xx |
| | | | | |
| **HD-HX-HV8**<br>**LD-LX-LV8**<br>**HS9**<br>**LS9**<br>**HD-HV9**<br>**LD-LV9**<br>**HXA-HVA**<br>**All HW et LV**<br>**HD-HV1000**<br>**LD-LV1000** | 2,5 | 6537P0010 | 220065R3611 | 220049R48xx |
| | 6 | 6537P0011 | 220065R3610 | 220049R45xx |
| | 10 | 6537P0012 | 220065R3610 | 220049R46xx |
| | 16 | 6537P0013 | 220065R3610 | 220049R47xx |
| | 25 | 6537P0014 | - | - |

Length 5 m / 10 m / 15 m / 25 m / 50 m. Add the length in metres to the cable product number.

(1) Option for L and H motors

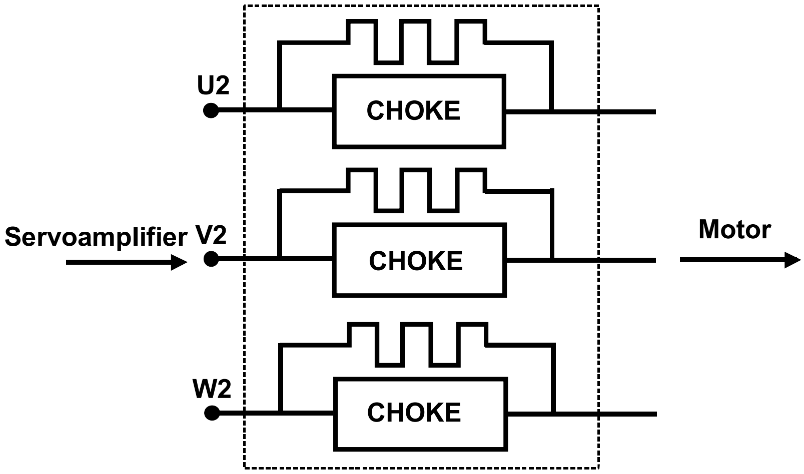
For more détails, see the "user and commissioning"  manuals of motors :

PVD3407 : LX-LS-LD-HD
PVD3490 : HX-HS-HD-HV
PVD3535 : NX

## 6.5.5 Guidelines for use of inductors and resistors for long cables between the motor and drive

The inductors and, where necessary, the resistors are to be fitted between the DIGIVEX Multi Motion (as close as possible to the drive) and the motor when used with long cable lengths.

N.B. It is not recommended to use chokes for driving HV or HW spindle motors.
Please ask the manufacturer about such cases.




References of inductors (Dimensions : see § 3.5.5)

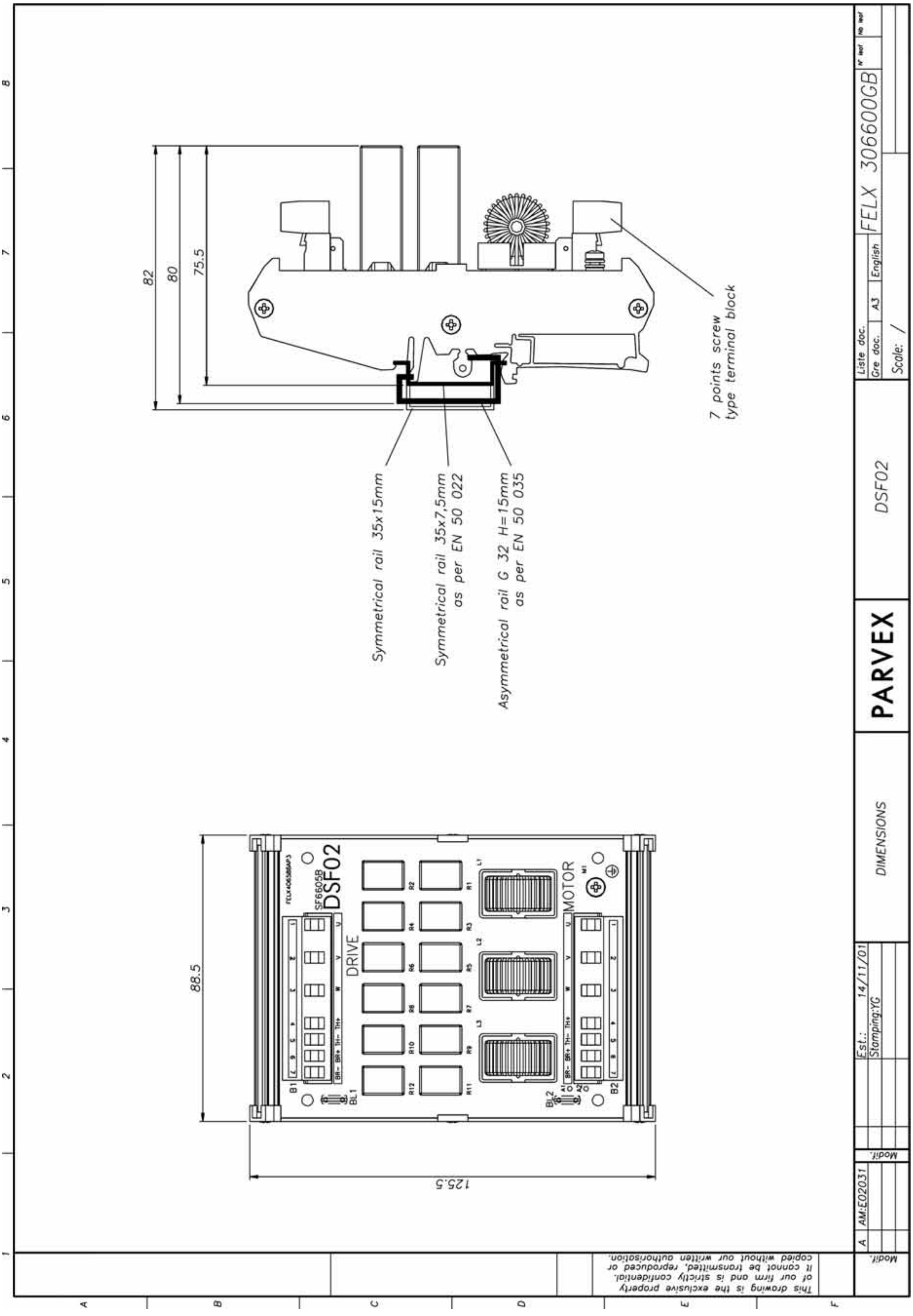
| | Cable length (L) | Normal | L ≤ 20 m | 20 < L < 30 m | 30 ≤ L < 70 m | 70 ≤ L < 100 m |
|---|---|---|---|---|---|---|
| | | Shielded | L ≤ 15 m | 15 < L < 20 m | 20 ≤ L < 50 m | 50 ≤ L < 70 m |
| DIGIVEX Multi Motion | 2/4 – 4/8 | | - Freq* : 8kHz | DSF02 Freq* : 8kHz | DSF02 Freq* : 4kHz | Not recommended Freq* : 4kHz |
| | 8/16 | | - Freq* : 8kHz | - Freq* : 8kHz | DSF02 Freq* : 4kHz | SF02032 + resistor Freq* : 4kHz |
| | 16/32 – 32/64 | | - Freq* : 8kHz | - Freq* : 8kHz | SF02025 + resistor Freq* : 4kHz | SF02025 + resistor Freq* : 4kHz |

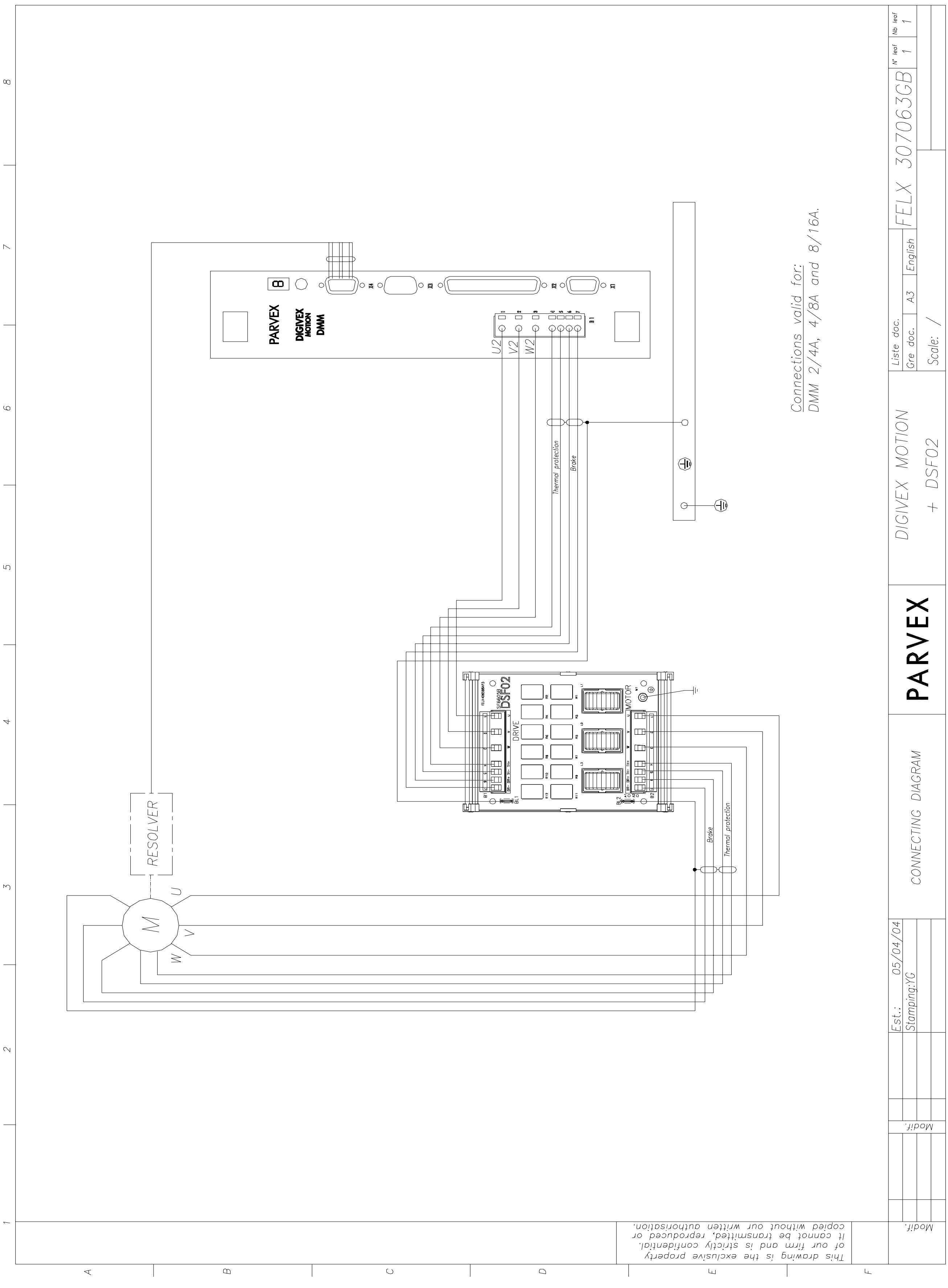
Freq*: Power bridge cutting frequency
Default frequency: 8kHz (factory setting for the drive; please refer to the PVD 3516: PME-DIGIVEX Motion Adjustment Manual, Hardware section, for the frequency selection)

Long cable lengths usually involve frequencies of 4kHz in line with the table below.

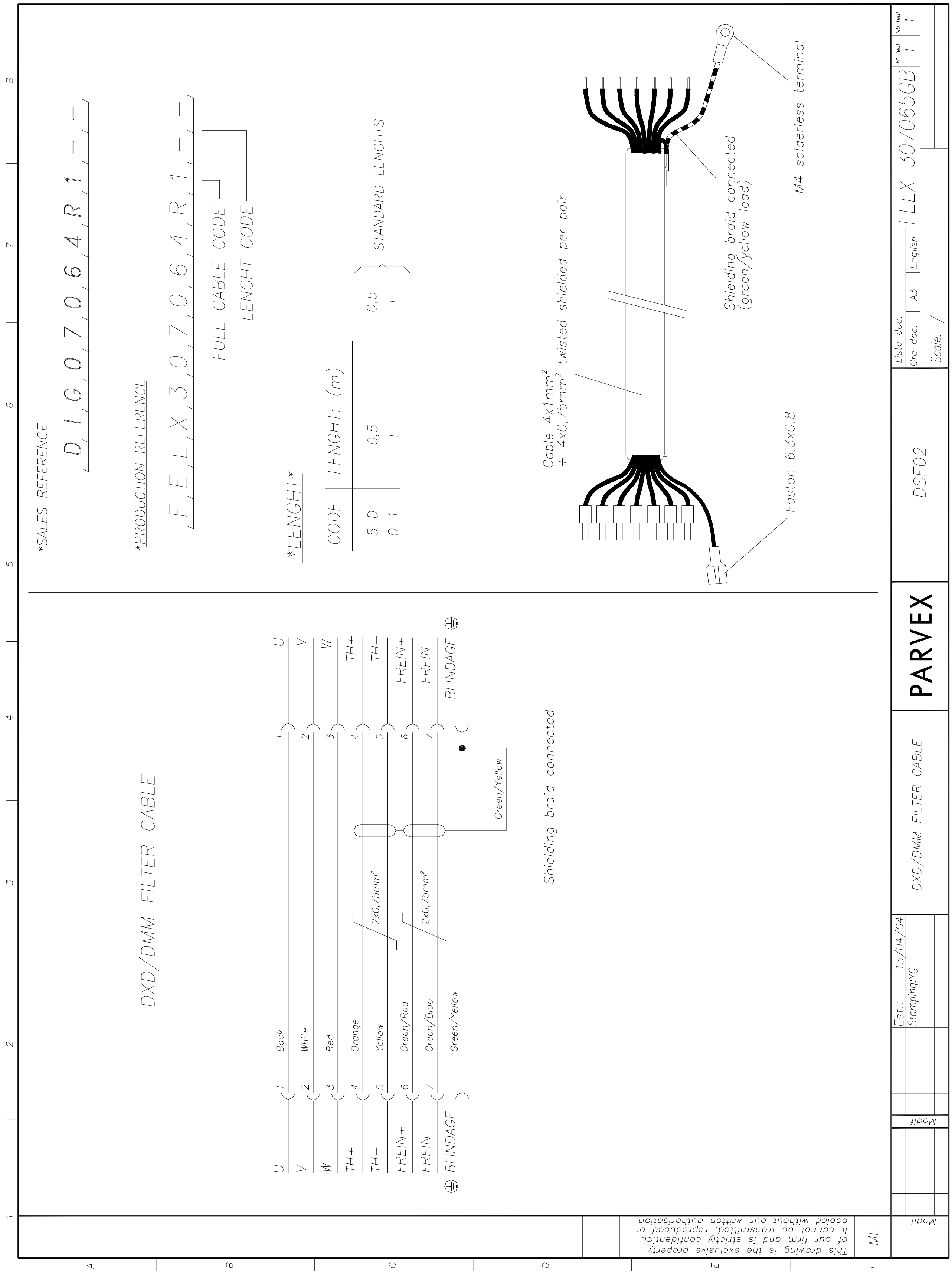
- DSF02: three inductances of 50 mH damped by resistors to rise on rail DIN
- For lengthes superior to 100 m, consult us.
- Damping resistor to be used with SF02025 and SF02032 :RE 40008 470 Ω 25 W

The use of self dampers for shorter distances can be envisaged to reduce parasite reception, caused by capacitive coupling with power cables.


82
80
75.5
7 points screw type terminal block
Symmetrical rail 35x15mm
Symmetrical rail 35x7,5mm as per EN 50 022
Asymmetrical rail G 32 H=15mm as per EN 50 035
88.5
125.5
DSF02
DRIVE
MOTOR
PARVEX
DIMENSIONS
FELX 306600GB
English
A3
Scale: /
Est.: 14/11/01
Stamping:YG
AM:E02031
Modif.
This drawing is the exclusive property of our firm and is strictly confidential. It cannot be transmitted, reproduced or copied without our written authorisation.


Connections valid for:
DMM 2/4A, 4/8A and 8/16A.
DIGIVEX MOTION
+ DSF02
PARVEX
CONNECTING DIAGRAM
FELX 307063GB
English
A3
Liste doc.
Gre doc.
Scale: /
Est.: 05/04/04
Stamping:YG
Modif.
This drawing is the exclusive property
of our firm and is strictly confidential.
It cannot be transmitted, reproduced or
copied without our written authorisation.
RESOLVER
M
U
V
W
U2
V2
W2
Thermal protection
Brake
DRIVE
MOTOR
DSF02
PARVEX
DIGIVEX
MOTION
DMM

Connection cable between DMM and DSF02



### 6.5.6 Holding Brake Connection

Brushless motors may be fitted with a brake of suitable dimensions to hold the drive immobilised. If 24 V dc ±10% is applied across the brake terminals, the brake disc is released and the motor can rotate.

The 24 V dc current for brake control must be regulated/filtered. It is to be connected to terminal block X1 of the DIGIVEX Power Supply and is then distributed internally to the DIGIVEX Drive modules. The brake is to be connected to terminals B1/6 (+) and B1/7 (-) for 2/4, 4/8,8/16 and 16/32 and to B2/1 and B2/2 of the DIGIVEX Drive for calibre 32/64.

**24 V brake output terminals :** Outputs assigned to motor brake control (terminal 6 to positive, terminal 7 to negative for calibres 2/4 to 16/32; terminal 3 to positive, terminal 4 to negative for calibre 32/64).
Normal braking voltage: 24 V dc ±10%.

The 24 V source enters the rack via the DIGIVEX POWER SUPPLY terminal X1. It is supplied externally and passes through the DIGIVEX unit to be redistributed to the drives. Protection is provided by a resettable 1.8 A fuse for calibres up to and including 8//16, and a 2.7 A fuse for calibres 16/32 and 32/64.

Voltage is monitored by the DIGIVEX DRIVE software and, if a brake is engaged, the drive acknowledges the disappearance of the 24 V.

### 6.5.7 Thermal protection Connection

The two terminals of the PTC probe located in the motor terminal box to be connectec to DIGIVEX Drive terminal blocks B1/4 and B1/5 for calibres 2/4, 4/8, 8/16 and 16/32 and to DIGIVEX Drive terminal blocks B2/1 and B2/2 for calibre 32/64.

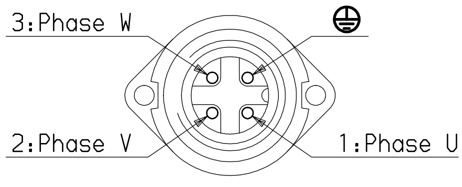
### 6.5.8 Motor Ventilation Connection

Some motors can be delivered as fan-cooled versions.

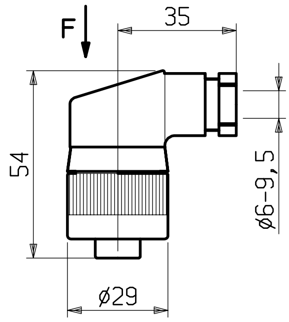
Fan characteristics :

- Supply voltage : 400 V three-phase, 50/60 Hz as standard.
- Power consumption : 45 W
- Connector type connection (plug 220056P0200 supplied on request).

When connecting check the direction of fan rotation and check that airflow is produced. The direction of airflow is shown on the dimension drawings.




View F




## 6.6 Resolver Connection

### 6.6.1 Description

The resolver is a high precision sensor (± 10 angular minutes as standard). It must be carefully wired :

- Separately routed power cable.
- Cable twisted and shielded in pair (sine, cosine, excite). The three shieldings must be connected to the metal cap of the SUB-D plug. Do not connect the shieldings at the motor end.

PARVEX SA can supply the cable in either of two versions :

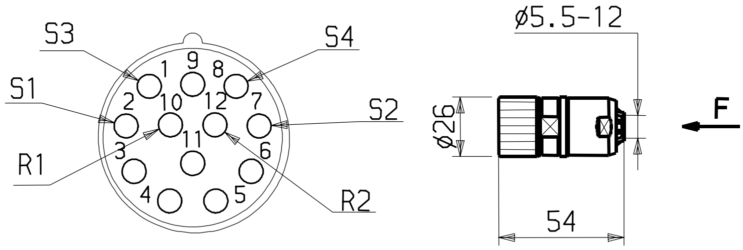
- Separate cable, in this case wire as shown in the diagram below.
- Cable fitted with SUB-D plug at drive end and connector at motor end. This solution is strongly recommended as the cable is ready for use.

Maximum distance between resolver and DIGIVEX DRIVE : 200 m. Please ask about longer cables.

Maximum permissible cross-sections :

- For SUB-D plug : 0.5mm≤.
- For removable connector plug. 0.14 to 0.5mm² (solder or crimp-fit contacts)

**RESOLVER CONNECTOR REMOVABLE PLUG** (motor end connector)
220065R4621 (solder-fit contacts - standard)
220065R1621 (crimp-fit contacts)




Viewed from F

**<u>For XD motors</u>** :
Connect by Sub-D connector under rear cover (cable routed through special cable gland).

Please ask for details.

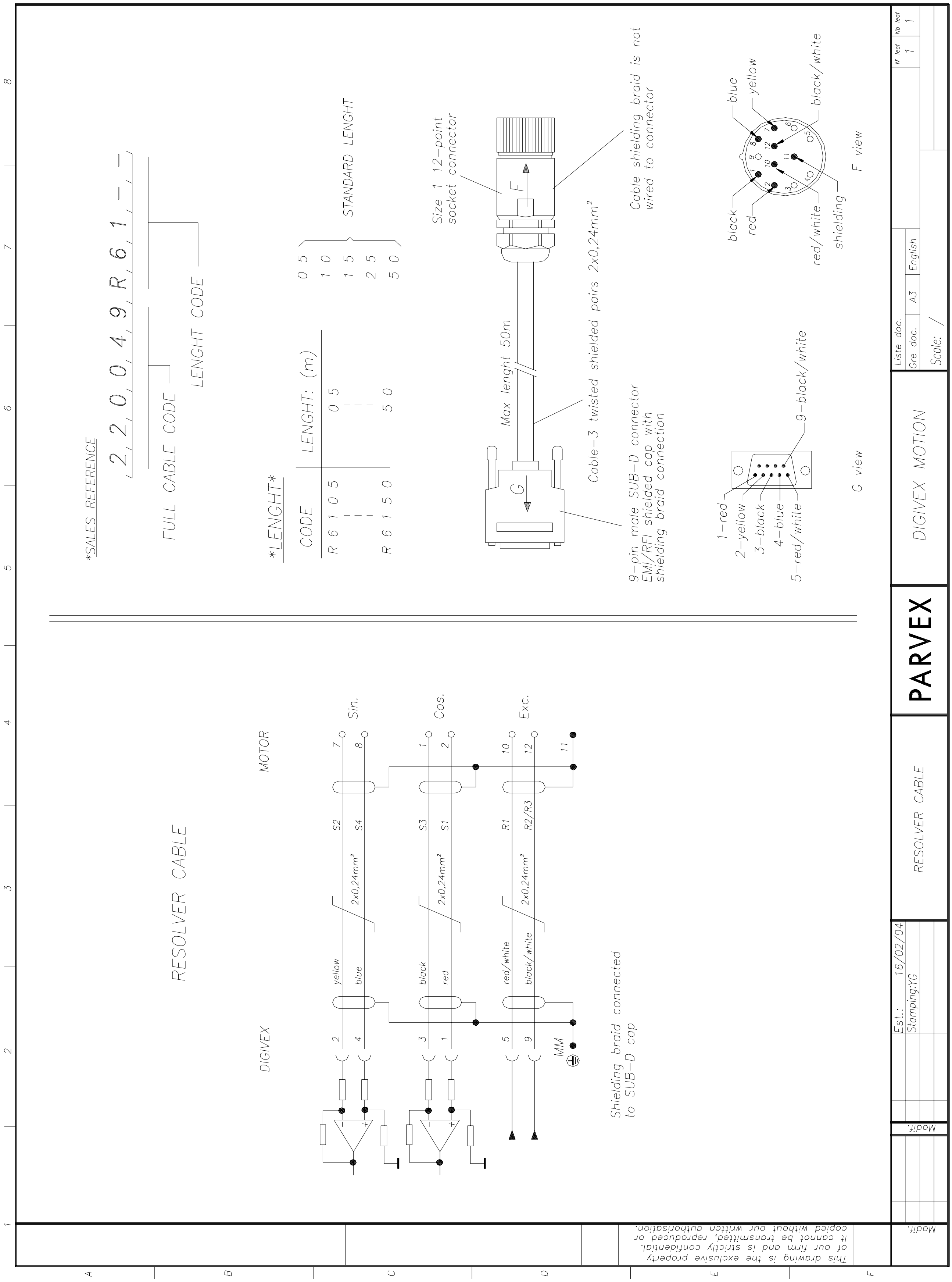
## 6.6.2 <u>Sub-D connector X4:"Resolver"</u>

DIGIVEX end connections, Sub-D 9 pin connector item ref. X4 "RESOLVER".
Maximum conductor cross-section: 0.5 mm²

| CONTACT | TYPE | FUNCTION |
|---|---|---|
| 1 | Input | Cosine S1 |
| 2 | Input | Sine S2 |
| 3 | Input | Cosine S3 |
| 4 | Input | Sine S4 |
| 5 | Output | Excitation R1 |
| 6 | - | Unused |
| 7 | - | Unused |
| 8 | - | Unused |
| 9 | Output | 0V Excite R2/3 |

## 6.6.3 <u>Cables</u>

Cables by meter: product number *: 6537P0001*
Complete cables (fitted with plug at the motor end and SUB-D connectors at the DSM end)
product number *220049R61xx (xx :* length in metres *5m/10m/15m/25m/50m).*


*SALES REFERENCE
2 2 0 0 4 9 R 6 1 - -
FULL CABLE CODE
LENGHT CODE
*LENGHT*
CODE
LENGHT: (m)
R 6 1 0 5
0 5
R 6 1 5 0
5 0
0 5
1 0
1 5
2 5
5 0
STANDARD LENGHT
Size 1 12-point socket connector
Cable shielding braid is not wired to connector
F
Max lenght 50m
Cable-3 twisted shielded pairs 2x0,24mm²
G
9-pin male SUB-D connector EMI/RFI shielded cap with shielding braid connection
blue
yellow
black/white
black
red
red/white
shielding
F view
1-red
2-yellow
3-black
4-blue
5-red/white
9-black/white
G view
RESOLVER CABLE
DIGIVEX
MOTOR
Sin.
Cos.
Exc.
yellow
blue
black
red
red/white
black/white
2x0,24mm²
S2
S4
S3
S1
R1
R2/R3
MM
Shielding braid connected to SUB-D cap
This drawing is the exclusive property of our firm and is strictly confidential. It cannot be transmitted, reproduced or copied without our written authorisation.
Modif.
Est.: 16/02/04
Stamping:YG
RESOLVER CABLE
PARVEX
DIGIVEX MOTION
Liste doc.
Gre doc.
A3
English
Scale: /
N° leaf 1
Nb leaf 1

# 6.7 FIELDBUS Connections

## 6.7.1 SUB-D X1 plug : FIELDBUS

Identify the nameplate on the front end :

CANopen → FIELDBUS = CANopen

PROFIBUS → FIELDBUS = Profibus

## 6.7.2 CANopen connections and cables

See DIGIVEX Motion - CANopen manual : PVD 3518

## 6.7.3 Profibus connections and cables

See DIGIVEX Motion - Profibus manual : PVD 3554

# 6.8 Input/Output connection

## 6.8.1 SUB-D X2 socket: Inputs/Outputs

| CONTACT | TYPE | FUNCTION | CHARACTERISTICS |
|---|---|---|---|
| 1<br>2<br>20 | 0 V<br>-12 V<br>+12 V | Symmetrical supply available for analogue I/O | Max. current available = ±50 mA |
| 3<br>21 | outa<br>0 V | ±10V analogue output | Analogue conversion: ≈ 9 bits + sign<br>Output ±10V / 3 mA<br>Protected against short circuits |
| 4<br>22 | ina +<br>ina - | ±10 V analogue input | Analogue conversion: 13 bits + sign<br>Differential input |
| 28<br>10 | + 24V<br>0V (1) | +24 V input for logic output supply<br>0V logic outputs | max. 400 mA for 8 outputs<br>Internally connected to X2-7 and X2-23 |
| 9<br>27<br>8<br>26<br>7 | out 0<br>out 1<br>out 2<br>out 3<br>0V (1) | Logic outputs<br>Logic outputs<br>Logic outputs<br>Logic outputs<br>0V logic outputs | 24 V PNP, optocoupled, max. 50 mA outputs, protected against short circuits<br>Internally connected to X2-10 and X2-23 |
| 25<br>6<br>24<br>5<br>23 | out 4<br>out 5<br>out 6<br>out 7<br>0V (1) | Logic outputs<br>Logic outputs<br>Logic outputs<br>Logic outputs<br>0V logic outputs | 24 V PNP, optocoupled, max. 50 mA outputs, protected against short circuits<br>Internally connected to X2-7 and X2-10 |
| 37<br>18<br>36<br>17<br>35<br>16<br>34<br>15<br>19 | in0<br>in1<br>in2<br>in3<br>in4<br>in5<br>in6<br>in7<br>COM0 | Logic input<br>Logic input<br>Logic input<br>Logic input<br>Logic input<br>Logic input<br>Logic input<br>Logic input<br>Common for inputs in0-in7 | Optocoupled logic inputs, type 1 under IEC 1131-2 |
| 33<br>14<br>32<br>13<br>31<br>12<br>30<br>11<br>29 | in8<br>in9<br>in10<br>in11<br>in12<br>in13<br>in14<br>in15<br>COM1 | Logic input<br>Logic input<br>Logic input<br>Logic input<br>Logic input<br>Logic input<br>Logic input<br>Logic input<br>Common for inputs in8-in15 | Optocoupled logic inputs, type 1 under IEC 1131-2 |

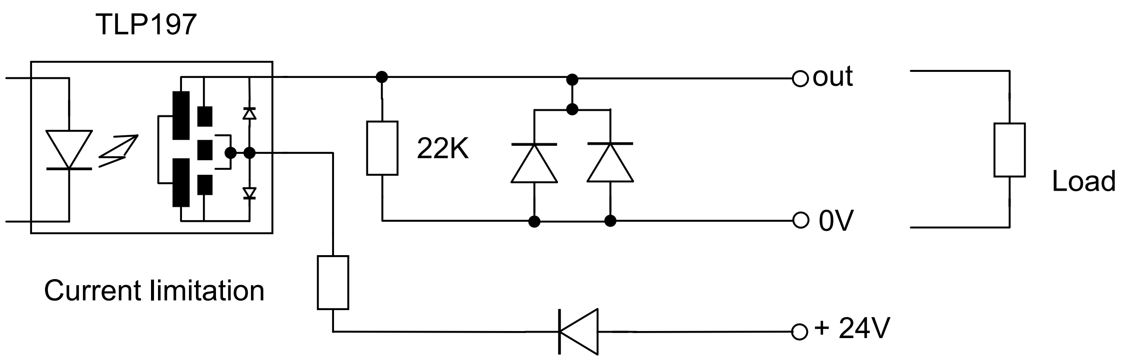
## 6.8.2 Input/Output characteristics

### 6.8.2.1 Logic outputs (out0 - out7)

- opto-mos outputs (2.5 kV isolation voltage), 24 V dc / 50 mA,
- PNP-type static outputs (load connected to negative supply pole) with diode in parallel on load and protection by current limitation,
- an output is said to be at 1 if it is activated (24 V dc output),
- user must provide 24 V dc supply for outputs (18 V ac rectified, filtered),
- 24 V dc supply input protected against reversals of polarity (diode).

⚠ To avoid any ill-timed output status change during drive initialization (when the auxiliary power supply appears), it is recommended to wait about 3 seconds before switching on the 24V DC supply of the outputs.

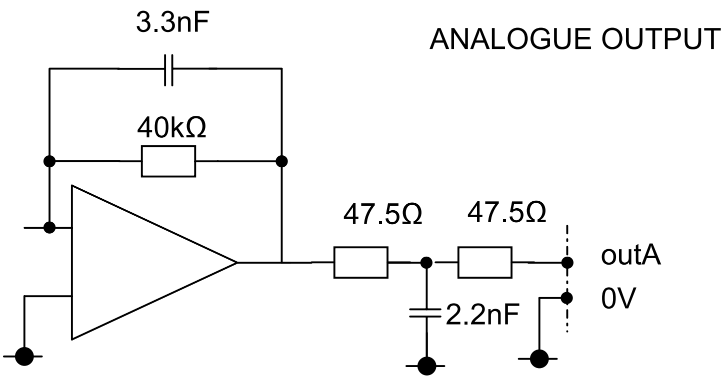
| | MIN | TYPICAL | MAX |
|---|---|---|---|
| **Supply voltage** | 5 V | 24 V | 40 V |
| **Output current (level 1)** | 0.05 mA | - | 50 mA |
| **Residual current (level 0)** | - | - | 0.001 mA |
| **Response time Ton (0-1)** | - | 0.3 ms | 1 ms |
| **Response time Toff (1-0)** | - | 0.2 ms | 1 ms |
| **Output voltage drop I = 50 mA** | - | - | 2 V |




### 6.8.2.2

### 6.8.2.3 Analogue output (outa)

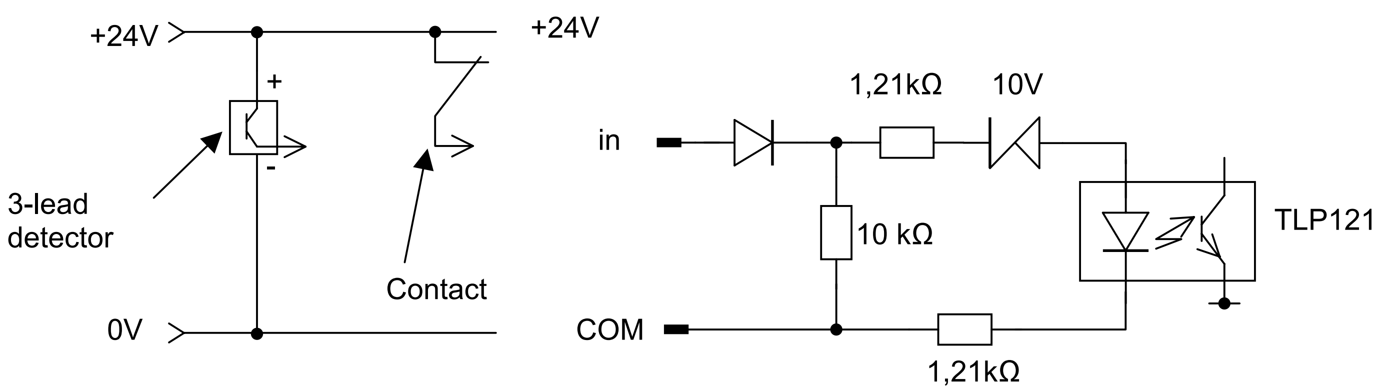
| | | |
|---|---|---|
| Analogue output | : | +/-10V |
| Resolution | : | ≈ 10 bits (9 bits + 1 sign bit) |
| Maximum output current | : | 5 mA (minimum load 2 K) |
| Source impedance | : | 100 ohms |



#### 6.8.2.4 Logic inputs (in0 - in 15)

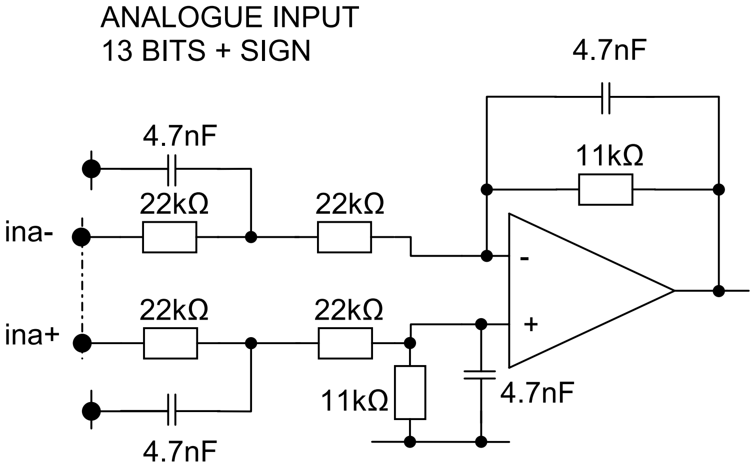
- opto-coupled 24V dc inputs (5 kV isolation voltage),
- type 1 inputs under IEC 1131-2,
- input load resistance: 10 K,
- an input is said to be at 1 if it is activated (24 V dc output). Otherwise it is said to be at 0,
- inputs may be connected directly to PNP type outputs (no external load resistor required),
- possibility of connecting 24 V dc "NC (normally closed) or NO (normally open) inductive proximity detectors : 3-lead, PNP output type (load connected to negative supply pole

| | MIN | TYPICAL | MAX |
|---|---|---|---|
| Input voltage (level 0) | - | 0 V | 5 V |
| Input voltage (level 1) | 15 V | 24 V | 30 V |
| Input current (level 0) | - | 0 mA | 0.5 mA |
| Input current (level 1) | 3 mA | 7 mA | 10 mA |
| Response time Ton (0-1)<br>Inputs In0-In3<br>Other inputs (in4-in15) | <br>-<br>- | <br>0.2 ms<br>1 ms | <br>-<br>- |
| Response time Toff (1-0)<br>Inputs In0-In3<br>Other inputs (in4-in15) | <br>-<br>- | <br>0.2 ms<br>1 ms | <br>-<br>- |



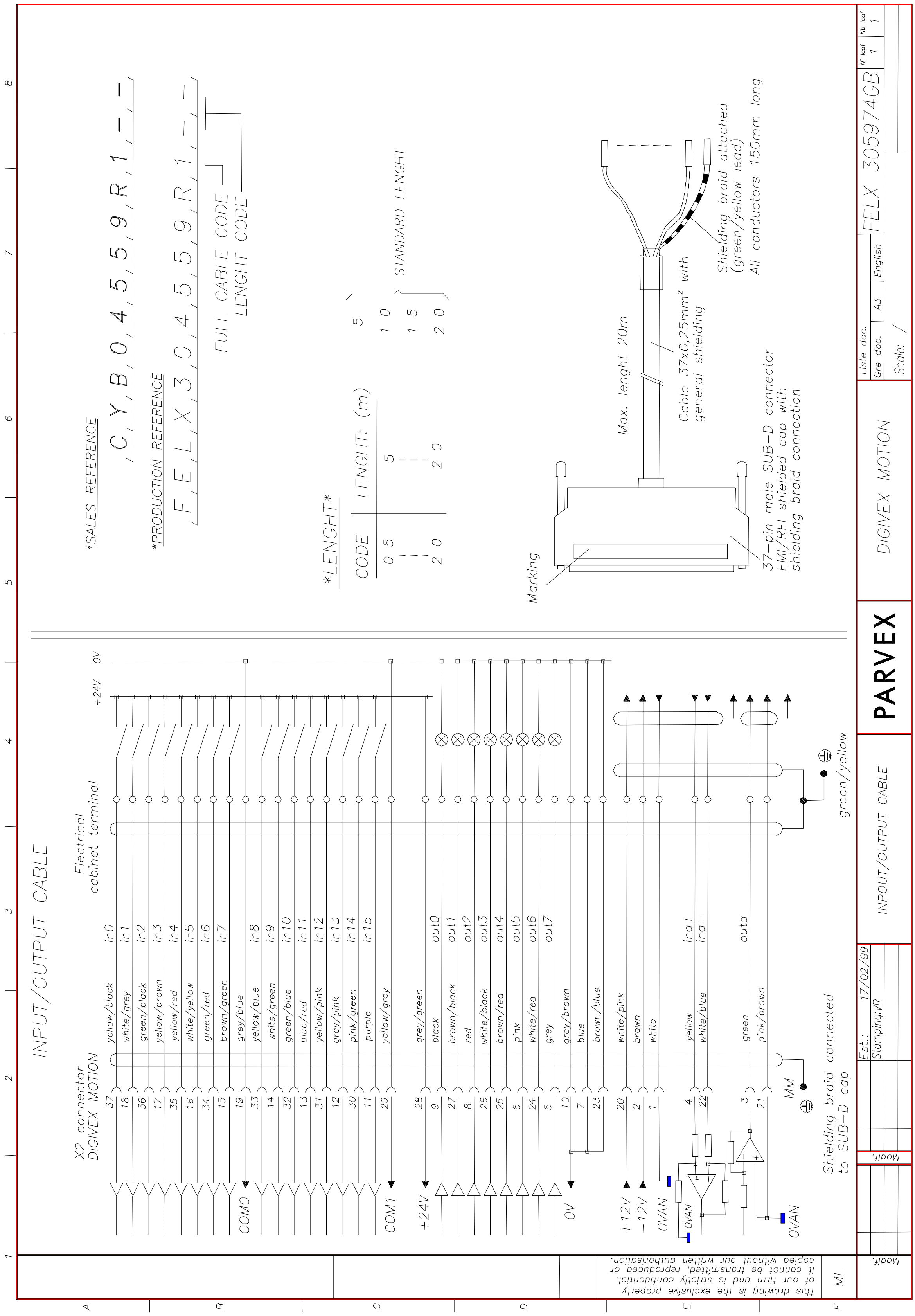
#### 6.8.2.5 Analogue input (ina)

- Differential input : +/-10V
- Resolution : 14 bits (13 bits + 1 sign bit)
- Input impedance : >40kΩ
- Maximum consumption on +12 V : 10 mA max.
- Maximum consumption on -12 V : 10 mA max.




## 6.8.3 Cable

Loose cables: product number CB 08304
Complete cables: product number CYB04559R1 xx (xx : defines the length in m) (equipped with SUB-D connectors). See drawing FELX 305974.


INPUT/OUTPUT CABLE
X2 connector DIGIVEX MOTION
Electrical cabinet terminal
+24V
0V
COM0
COM1
+12V
-12V
0VAN
MM
Shielding braid connected to SUB-D cap
green/yellow
*SALES REFERENCE
C Y B 0 4 5 5 9 R 1 - -
*PRODUCTION REFERENCE
F E L X 3 0 4 5 5 9 R 1 - -
FULL CABLE CODE
LENGHT CODE
*LENGHT*
CODE
LENGHT: (m)
05
20
5
20
10
15
STANDARD LENGHT
Max. lenght 20m
Cable 37x0,25mm² with general shielding
Shielding braid attached (green/yellow lead)
All conductors 150mm long
Marking
37-pin male SUB-D connector EMI/RFI shielded cap with shielding braid connection
This drawing is the exclusive property of our firm and is strictly confidential. It cannot be transmitted, reproduced or copied without our written authorization.
Est.: 17/02/99
Stamping:VR
INPOUT/OUTPUT CABLE
PARVEX
DIGIVEX MOTION
Liste doc.
Gre doc.
A3
English
Scale: /
FELX 305974GB
Modif.
ML

# 6.9 Encoder emulation option connection (SC6639)

## 6.9.1 Description

This optional board, fitted in the DSM, converts the signal from the resolver into a series of pulses identical to those from an incremental encoder: A, B, Zero Mark and their complements.

## 6.9.2 Sub-D connector X3: encoder emulation option

Sub-D 9-pin plug, "Encoder". Maximum conductor cross-section: 0.5 mm².

| CONTACT | TYPE | FUNCTION | Characteristics |
|---|---|---|---|
| 5<br>9 | Input<br>Input | 5V<br>0V | Max. current = 100 mA |
| 7<br>3 | Output<br>Output | A<br>$\overline{A}$ | Encoder channel A<br>Encoder channel $\overline{A}$ |
| 8<br>4 | Output<br>Output | B<br>$\overline{B}$ | Encoder channel B<br>Encoder channel $\overline{B}$ |
| 6<br>2 | Output<br>Output | zero mark<br>$\overline{\text{zero mark}}$ | Encoder channel zero mark<br>Encoder channel $\overline{\text{zero mark}}$ |

## 6.9.3 Programming resolution and zero mark position

This is done with the PME DIGIVEX-MOTION. (See the Manual PVD3516)

These parameters can be called up by selecting the "Input/Output parameters menu with the "options" tab.

**Resolution**

Adjustable between 1 and 16384, either by +/- keys, or be entering the number directly (in "OFF LINE" mode only).

**Zero Mark Setting**

Adjust by trial-and-error with the PC working in "ON LINE" mode.

When the operator judges the position is suitable, he confirms by acknowledging the zero mark.

## 6.9.4 Electrical characteristics

The electrical output interface meets standard RS422 for differential serial links. The circuit used is a "LINE DRIVER" of the 26C31 type. The electrical characteristics are therefore closely related to the use of this component.

**Voltage supply**

The encoder emulation boards are electrically isolated between the output stage through three optocouplers, needing to be powered by an external +5V ±10%, 100 mA source, as for all incremental encoders.

In no case can this power supply, which is intended only for electrical isolation, be used to keep position information from the resolver in the event of failure of the drive's low-level power supply.

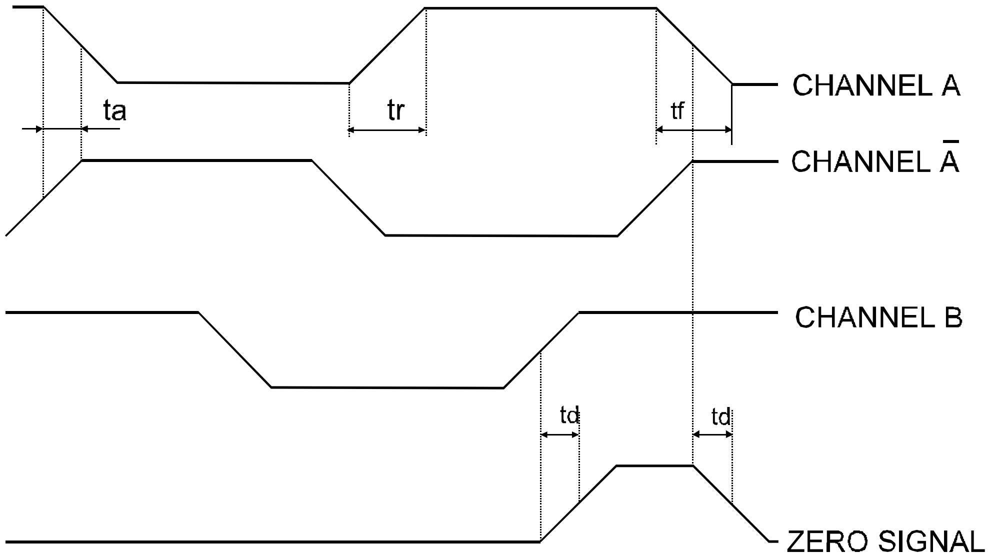
**Short-circuit capability**

A single output may be short-circuited at 0 V at any given time

**Signal form**

Signal levels:

- U high ≥ 2.5V for I high ≥ -20mA
- U low ≤ 0.5V for I low ≤ 20mA




**Switching time:**

Rise or fall time defined from 10% to 90% of the magnitude in question, without cable and without load.

tr = tf = 45ns (typical value)

**Time delay between direct and complemented channels**

Time delay defined at 50% of magnitudes in question without cable and without load.

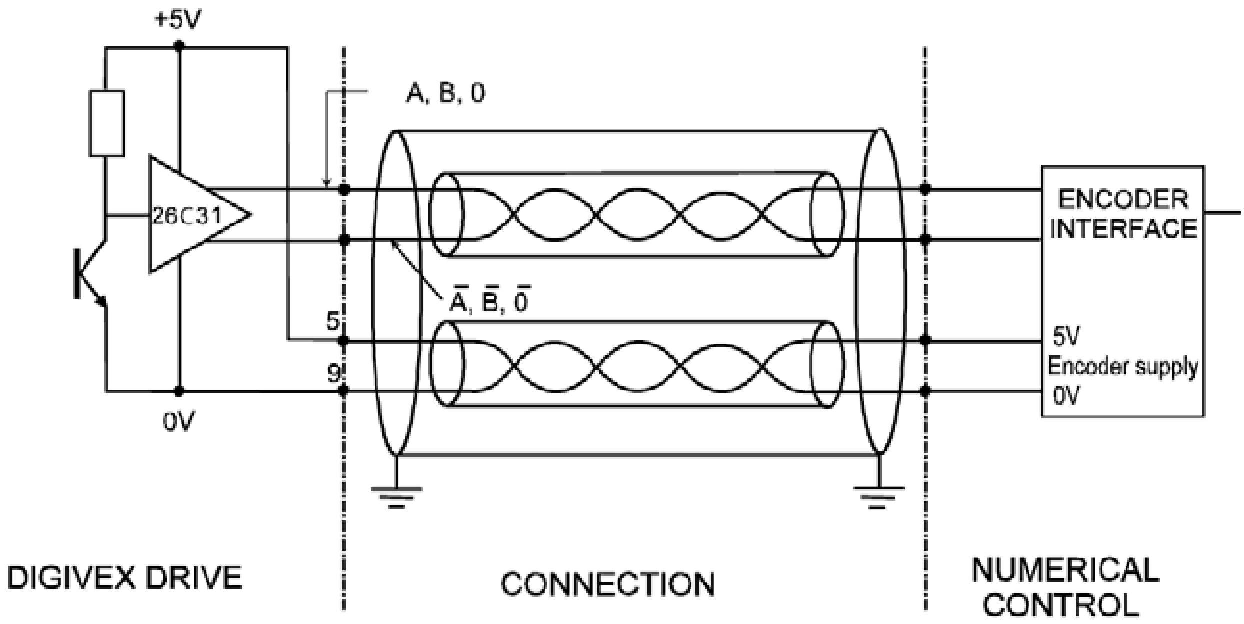
-6ns ≤ ta ≤ 6ns (maximum)

**maximum frequency** : 500 kHz on signals A or B

**Time interval between channels A, B and the zero mark**

Time delay defined at 50% of magnitudes in question without cable and without load.

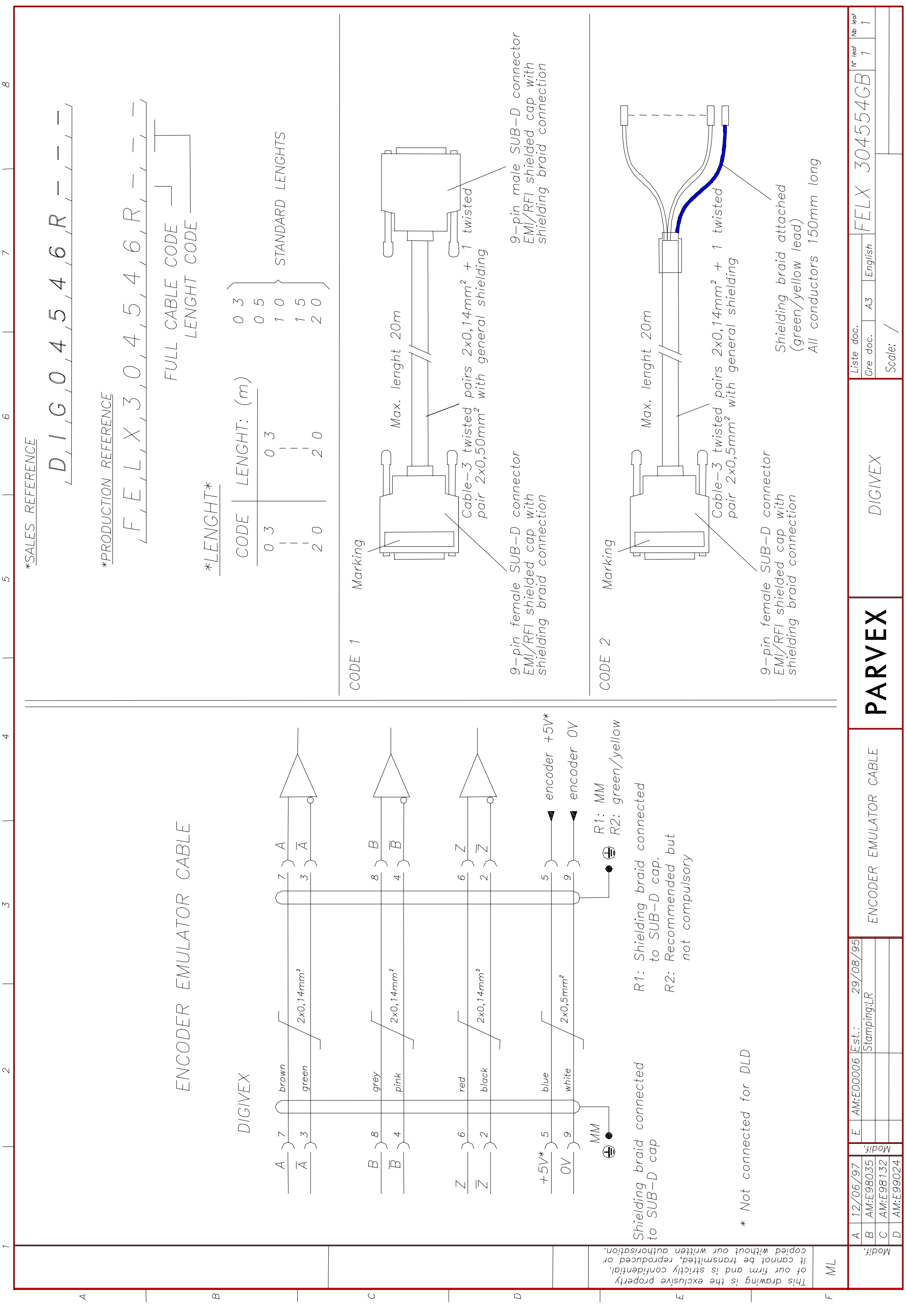
$-6ns \leq td \leq 6ns$ (maximum)




## 6.9.5 Cable

Cable can be supplied with SUB-D connectors, see drawing FELX 304554.

Product number DIG 04546R1xx (2 SUB-D connector)
DIG 04546R2xx (1 SUB-D connector)
(xx : defines length in metres)


ENCODER EMULATOR CABLE
DIGIVEX
brown
green
grey
pink
red
black
blue
white
2x0,14mm²
2x0,5mm²
encoder +5V*
encoder 0V
Shielding braid connected to SUB-D cap
* Not connected for DLD
R1: Shielding braid connected to SUB-D cap.
R2: Recommended but not compulsory
R1: MM
R2: green/yellow
*SALES REFERENCE
D I G 0 4 5 4 6 R - - -
*PRODUCTION REFERENCE
F E L X 3 0 4 5 4 6 R - - -
FULL CABLE CODE
LENGHT CODE
*LENGHT*
CODE
LENGHT: (m)
STANDARD LENGHTS
CODE 1
CODE 2
Marking
Max. lenght 20m
Cable-3 twisted pairs 2x0,14mm² + 1 twisted pair 2x0,50mm² with general shielding
Cable-3 twisted pairs 2x0,14mm² + 1 twisted pair 2x0,5mm² with general shielding
9-pin female SUB-D connector EMI/RFI shielded cap with shielding braid connection
9-pin male SUB-D connector EMI/RFI shielded cap with shielding braid connection
Shielding braid attached (green/yellow lead)
All conductors 150mm long
This drawing is the exclusive property of our firm and is strictly confidential. It cannot be transmitted, reproduced or copied without our written authorisation.
ENCODER EMULATOR CABLE
PARVEX
DIGIVEX
FELX 304554GB
Scale: /
English

# 6.10 External encoder input option connection (SC6638)

## 6.10.1 Description

This option board, placed in the DSM, is used to connect an external incremental encoder which may be used:

- either as a master axis for synchronization with an external moving component, or as a cam type function.

- or as a position measuring device if position measurement given by the resolver is unsuitable,
  Caution: in this case, the resolver must be connected nevertheless.

- or as a position measuring device for refined applications where allowance must be made for position on the part and not on the motor.
  Caution: in this case, the resolver must be connected nevertheless.

- or as an automatic control and position measuring device
  Attention : in this case, the motor shaft must be mechanically free so that the motor can be polarized using user program as Motor_polarization.bdm which is to be found under : C:\Program Files\Parvex\Pme4.xx\App_Parvex\Samples\Misc.
  The drive in7 input and out7 output are assigned to this program :
  - in7 = 1 authorizes the calibration phase to start.
  - out7= 1 when the calibration phase is completed.

  This program is only given as an example and can be modified according to the customer application.

The position sensor must be an incremental encoder type, with complemented track, with a line driver:

- tracks A, $\overline{A}$, B, $\overline{B}$, zero mark, $\overline{\text{zero mark}}$
- supply +5 V
- maximum consumption 250 mA
- maximum frequency: 250 kHz on signals A or B
- Encoder +5V supply voltage is provided by the DSM from a +24V DC external supply.

## 6.10.2 SUB-D X3 sockets: encoder input option

| CONTACT | TYPE | FUNCTION | Characteristics |
|---|---|---|---|
| 5<br>9 | Output<br>Output | 5V<br>0V | max. 250 mA encoder supply<br>⚠ : + 24 V supply to sockets X2-28 / X2-10 is required for encoder supply |
| 7<br>3 | Input<br>Input | A<br>$\overline{A}$ | Encoder channel A<br>Encoder channel $\overline{A}$ |
| 8<br>4 | Input<br>Input | B<br>$\overline{B}$ | Encoder channel B<br>Encoder channel $\overline{B}$ |
| 6<br>2 | Input<br>Input | Zero mark<br>$\overline{\text{zero mark}}$ | Encoder channel zero mark<br>Voie codeur $\overline{\text{zero mark}}$ |

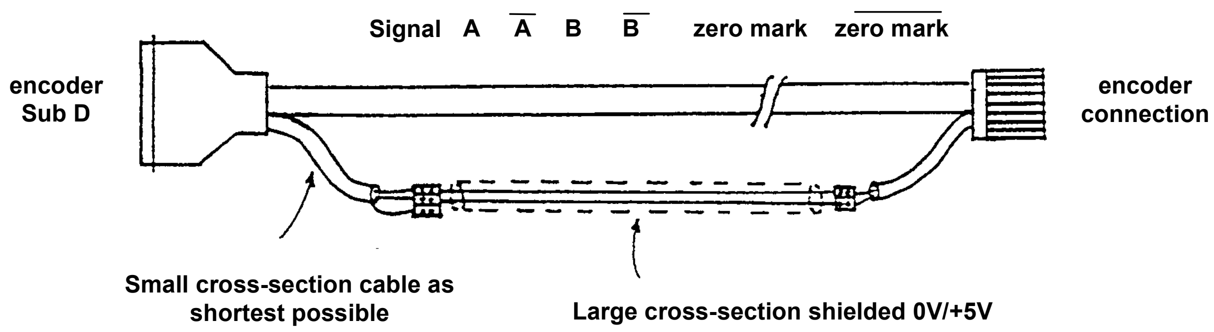
## 6.10.3 Cable

The DSM-Encoder connection cable shall be made up of three twisted pairs of cross-section of 14 mm$^2$ or more (for signal transmission) and one larger pair (for encoder supply).

Encoder supply cable cross-section:

- 20 m cable 150 mA current → 0.5 mm²
- 35 m cable 150 mA current → 1 mm²
- 10 m cable 200 mA current → 0.5 mm²
- 20 m cable 200 mA current → 1 mm²
- 50 m cable 200 mA current → 2.5 mm²
- 10 m cable 250 mA current → 0.75 mm²
- 20 m cable 250 mA current → 1.5 mm²
- 40 m cable 250 mA current → 2.5 mm²

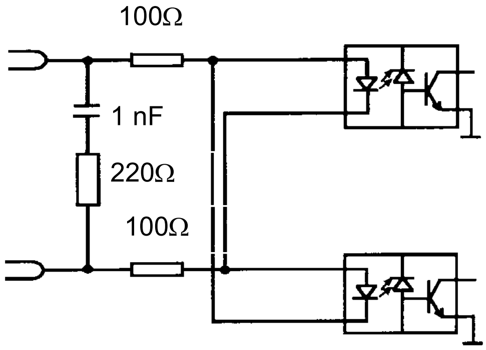
Some of the cross-sections defined above are difficult to wire to a SUB-D connector, in which case the following wiring arrangement may be used.

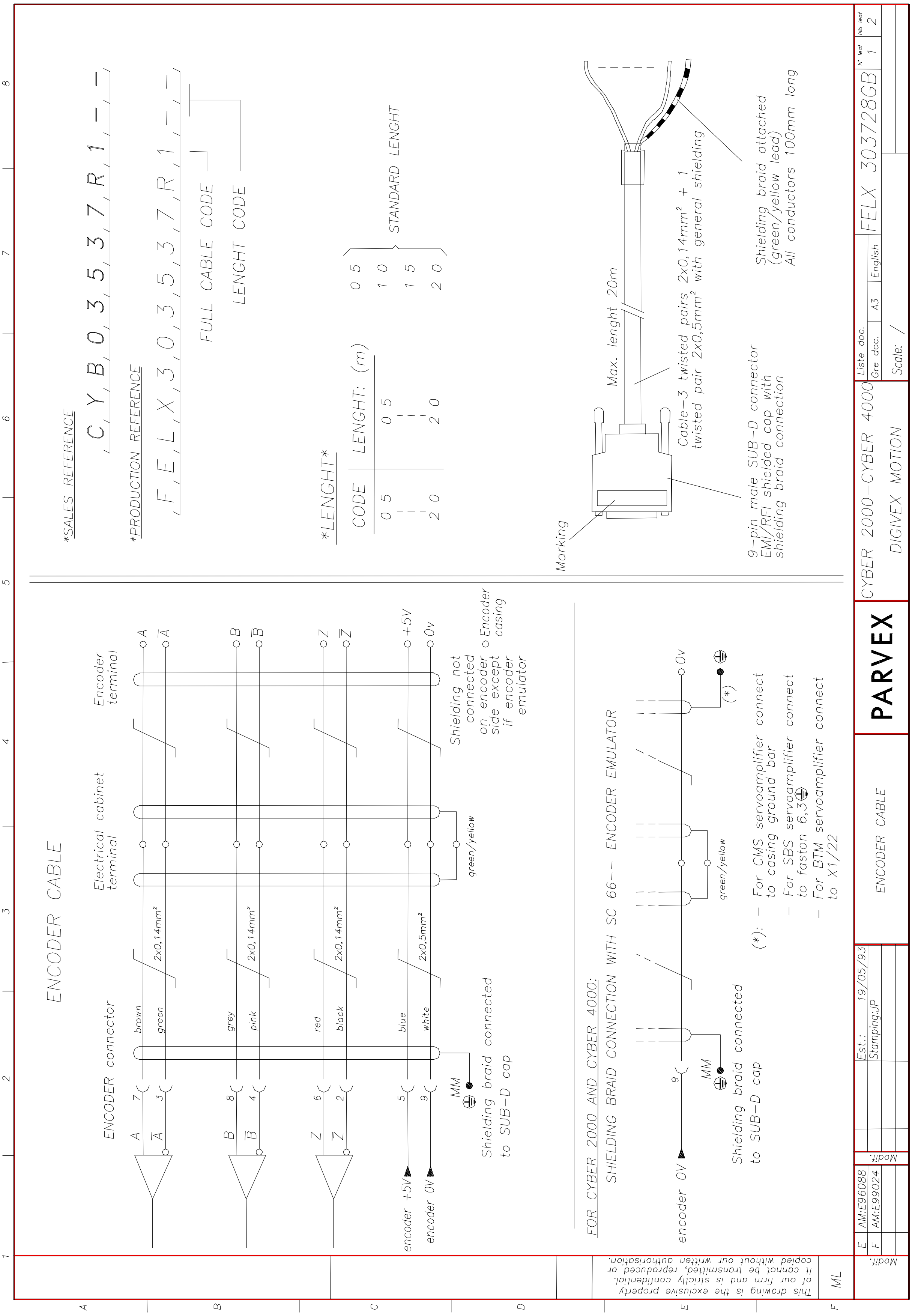


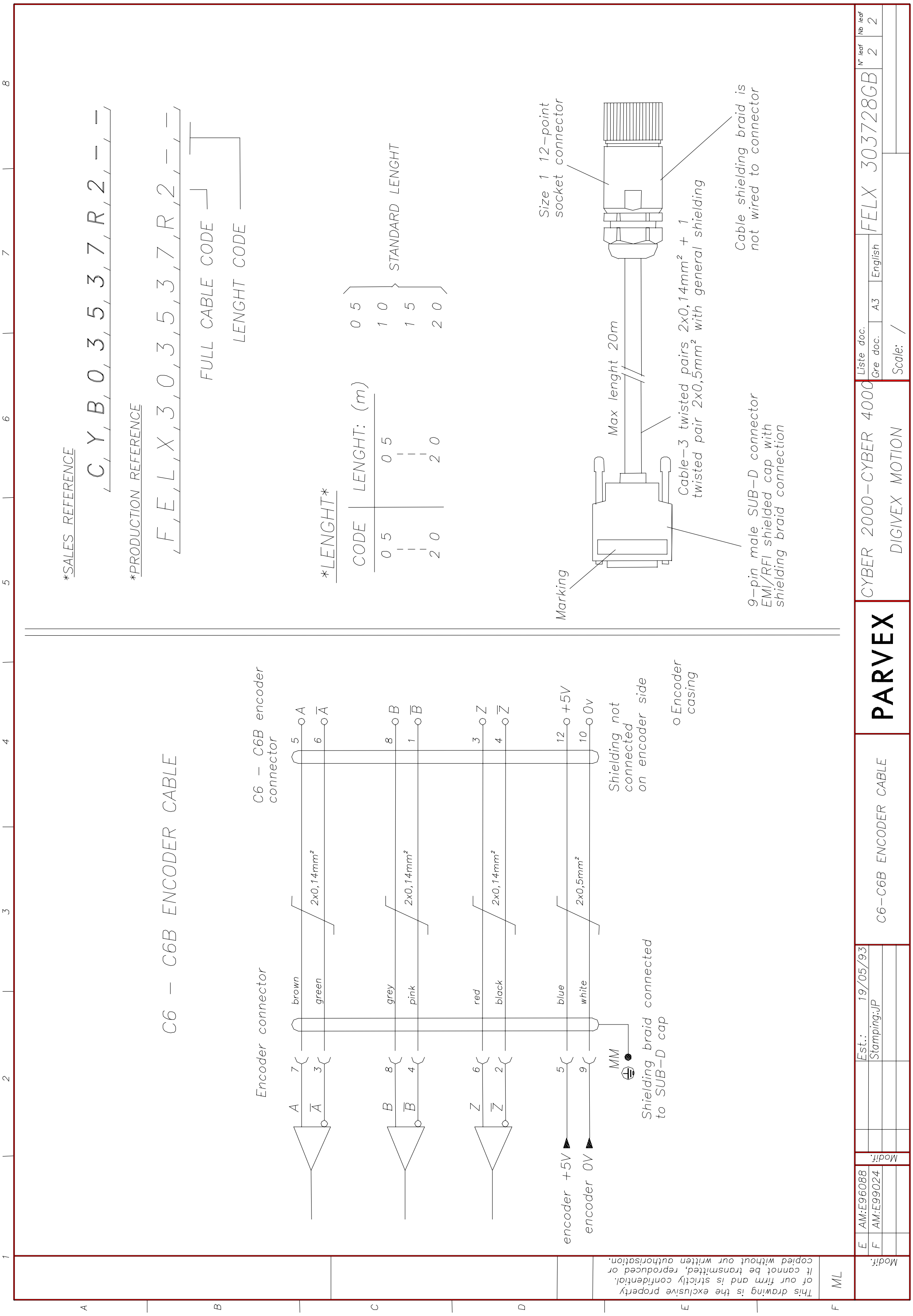
For higher values an external +5V supply must be installed near to the encoder to prevent voltage loss over long lengths of cable.

Input interface :

| Input voltage MIN. | MIN | TYPYCAL | MAX |
|---|---|---|---|
| level 0 | - | 0 V | 1 V |
| level 1 | 3 V | 5 V | 5.5 V |




ENCODER CABLE
ENCODER connector
Electrical cabinet terminal
Encoder terminal
brown
green
grey
pink
red
black
blue
white
2x0,14mm²
2x0,5mm²
green/yellow
encoder +5V
encoder 0V
+5V
0v
Encoder casing
Shielding braid connected to SUB-D cap
Shielding not connected on encoder side except if encoder emulator
FOR CYBER 2000 AND CYBER 4000:
SHIELDING BRAID CONNECTION WITH SC 66-- ENCODER EMULATOR
encoder 0V
(*): - For CMS servoamplifier connect to casing ground bar
- For SBS servoamplifier connect to faston 6,3
- For BTM servoamplifier connect to X1/22
*SALES REFERENCE
C Y B 0 3 5 3 7 R 1 - -
*PRODUCTION REFERENCE
F E L X 3 0 3 5 3 7 R 1 - -
FULL CABLE CODE
LENGHT CODE
*LENGHT*
CODE
LENGHT: (m)
STANDARD LENGHT
Max. lenght 20m
Cable-3 twisted pairs 2x0,14mm² + 1 twisted pair 2x0,5mm² with general shielding
Shielding braid attached (green/yellow lead)
All conductors 100mm long
9-pin male SUB-D connector EMI/RFI shielded cap with shielding braid connection
Marking
CYBER 2000-CYBER 4000
DIGIVEX MOTION
ENCODER CABLE
PARVEX
FELX 303728GB
Liste doc.
Gre doc.
A3
English
Scale: /
Est.: 19/05/93
Stamping:JP
E AM:E96088
F AM:E99024
Modif.
This drawing is the exclusive property of our firm and is strictly confidential. It cannot be transmitted, reproduced or copied without our written authorisation.
ML


C6 - C6B ENCODER CABLE
Encoder connector
C6 - C6B encoder connector
A
Ā
B
B̄
Z
Z̄
brown
green
grey
pink
red
black
blue
white
2x0,14mm²
2x0,14mm²
2x0,14mm²
2x0,5mm²
encoder +5V
encoder 0V
+5V
0v
MM
Shielding braid connected to SUB-D cap
Shielding not connected on encoder side
Encoder casing
*SALES REFERENCE
C Y B 0 3 5 3 7 R 2 - -
*PRODUCTION REFERENCE
F E L X 3 0 3 5 3 7 R 2 - -
FULL CABLE CODE
LENGHT CODE
*LENGHT*
CODE
LENGHT: (m)
STANDARD LENGHT
Size 1 12-point socket connector
Cable shielding braid is not wired to connector
Max lenght 20m
Cable-3 twisted pairs 2x0,14mm² + 1 twisted pair 2x0,5mm² with general shielding
9-pin male SUB-D connector EMI/RFI shielded cap with shielding braid connection
Marking
This drawing is the exclusive property of our firm and is strictly confidential. It cannot be transmitted, reproduced or copied without our written authorisation.
ML
E AM:E96088
F AM:E99024
Modif.
Est.: 19/05/93
Stamping:JP
C6-C6B ENCODER CABLE
PARVEX
CYBER 2000-CYBER 4000
DIGIVEX MOTION
Liste doc.
Gre doc.
A3
English
Scale: /
FELX 303728GB
N° leaf 2
Nb leaf 2

# 6.11 Connecting the SinCos encoder input option (SC6645)

## 6.11.1 Description

This optional card, placed in the DSM, is used to connect a SinCos encoder which acts as an automatic motor and position measurement control unit for applications requiring both rotation speed and significant resolution.

Attention: in this case, the motor shaft must be mechanically free so that the motor can be polarized using a user program w as Motor_polarization.bdm which is to be found under C:\Program Files\Parvex\Pme4.xx\App_Parvex\Samples\Misc.
The input (in7) and the output (out7) are assigned to this program:

- in7 = 1 authorizes the polarization phase to start.
- out7= 1 when the motor polarization phase is completed.

This program is only given as an example and can be modified according to the customer.application

In addition, a program available under PME (Parameter editor -> Motor/Resolver -> Setting SinCos encoder parameters) can be used to equalize any SINE and COSINE channel offsets as well as any differences in amplitude between the same channels.

The resolution obtained via the SinCos encoder is given by the formula:

**RESOLUTION = NUMBER OF ENCODER PERIODS OF SINE X INTERPOLATION FACTOR** with the INTERPOLATION FACTOR being approx. equal to 512 points; the interpolation factor is the breakdown of a sinusoidal signal as a given number of points.

The position sensor should be a SIN/COS encoder with sinusoidal outputs:

- Tracks A, $\overline{A}$, B, $\overline{B}$, Top0, $\overline{Top0}$ (analog).
- 2 signals, A and B, in quadrature and their inverted signals $\overline{A}$ $\overline{B}$, being short circuit resistant.
- Maximum number of authorized encoder periods of sine: 65536 periods/revolution.
- Level of differential peak to peak voltages A $\overline{A}$ and B $\overline{B}$ between 0.8 V (AC) and 1.1 V (AC).
- Power supply +5V.
- Maximum consumption 250 mA.
- Maximum frequency: 200 kHz for the A or B signals.
- An external 24V +/- 10% power supply must be provided to supply the SC6645 option card via the DSM SUB-D X2 (Contact 28: + 24V, Contact 10: 0V). An isolated DC-DC converter (24V /5V), on the option card is used to supply the encoder with 5V.
  Attention: The external power supply needs to be 24V DC +/- 10%.

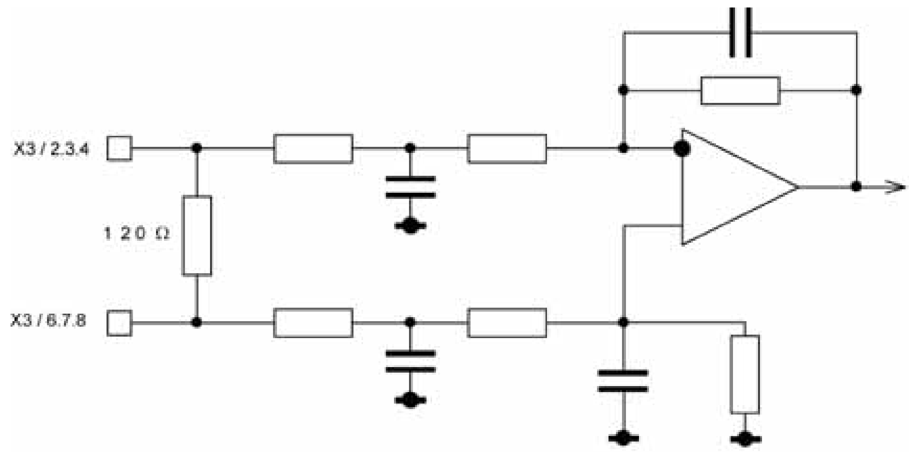
## 6.11.2 SUB-D X3 plug: Encoder input option.

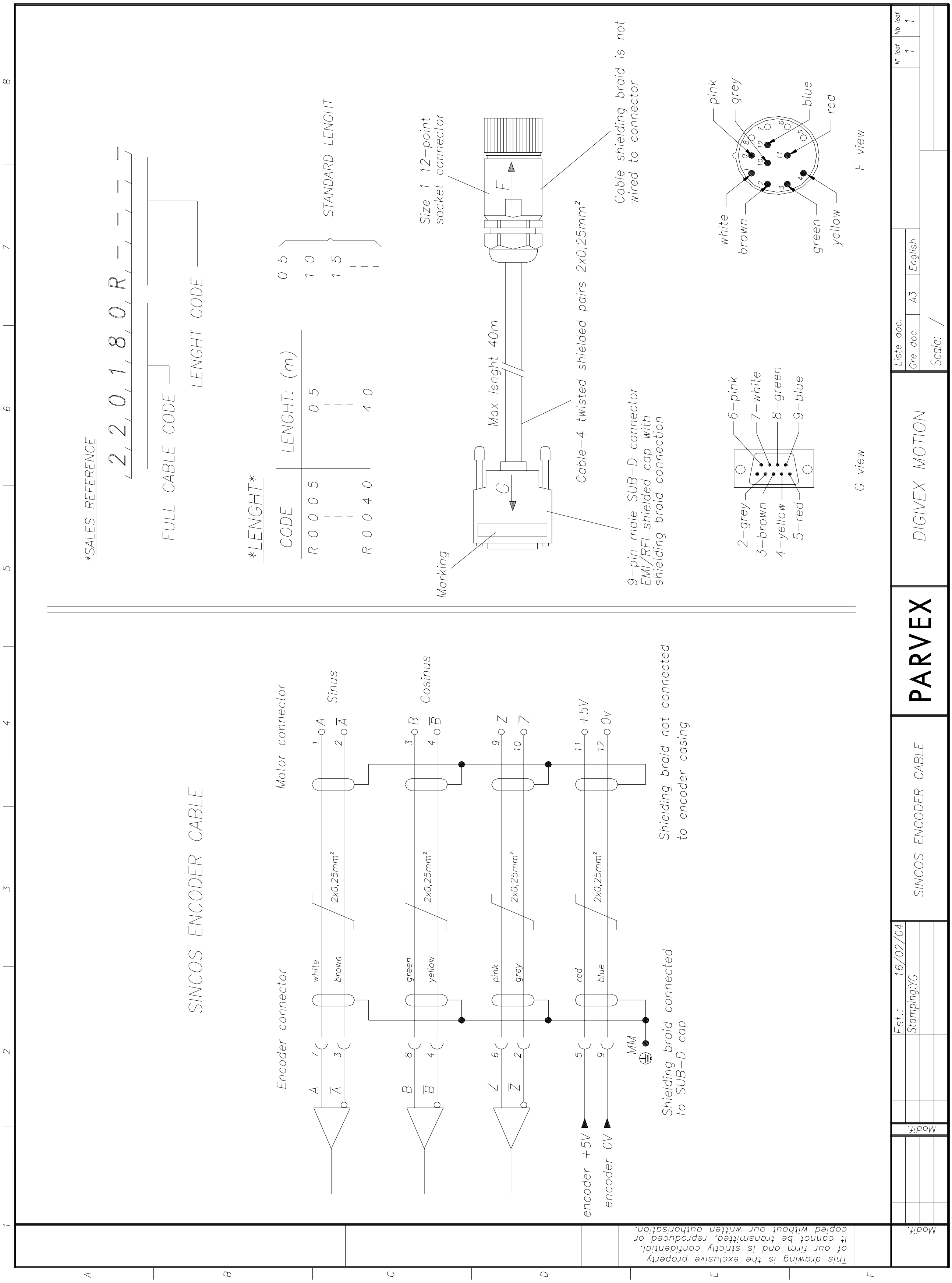
| CONTACT | TYPE | ROLE | Characteristics |
|---|---|---|---|
| 5<br>9 | Output<br>Output | 5V<br>0V | Encoder power supply: maximum output 250 mA.<br>⚠: a +24V power supply for X2-28 / X2-10 plug is required for processing the encoder power supply |
| 7<br>3 | Input<br>Input | A<br>$\overline{A}$ | Encoder channel A<br>SINE signal (differential inputs)<br>Encoder channel $\overline{A}$ |
| 8<br>4 | Input<br>Input | B<br>$\overline{B}$ | Encoder channel B<br>COSINE signal (differential inputs)<br>Encoder channel $\overline{B}$ |
| 6<br>2 | Input<br>Input | Top 0<br>$\overline{\text{Top 0}}$ | Encoder channel Top 0<br>(differential inputs)<br>Encoder channel $\overline{\text{Top 0}}$ |

## 6.11.3 Cables

The DSM connection cable should be made up of 4 twisted pairs, shielded in pairs, with sections greater than or equal to 0.25 $mm^2$.
The maximum cable length is 40 m. Please consult us for information on longer cable lengths.
There is an approved PARVEX cable for controlling with SinCos encoder.

Input interface:
The input signals for the encoder input card should be sinusoidal and differential with peak to peak values between 0.8 V and 1.1 V.




SINCOS ENCODER CABLE
Encoder connector
Motor connector
Sinus
Cosinus
2x0,25mm²
white
brown
green
yellow
pink
grey
red
blue
encoder +5V
encoder 0V
Shielding braid connected to SUB-D cap
Shielding braid not connected to encoder casing
*SALES REFERENCE
2 2 0 1 8 0 R - - -
FULL CABLE CODE
LENGHT CODE
*LENGHT*
CODE
LENGHT: (m)
R 0 0 0 5
R 0 0 4 0
0 5
4 0
STANDARD LENGHT
Size 1 12-point socket connector
Cable shielding braid is not wired to connector
Max lenght 40m
Cable-4 twisted shielded pairs 2x0,25mm²
9-pin male SUB-D connector EMI/RFI shielded cap with shielding braid connection
Marking
F view
G view
2-grey
3-brown
4-yellow
5-red
6-pink
7-white
8-green
9-blue
This drawing is the exclusive property of our firm and is strictly confidential. It cannot be transmitted, reproduced or copied without our written authorisation.
Modif.
Est.: 16/02/04
Stamping:YG
SINCOS ENCODER CABLE
PARVEX
DIGIVEX MOTION
Liste doc.
Gre doc.
A3
English
Scale: /
N° leaf 1
Nb leaf 1

# 7. COMMISSIONING - DIAGNOSTICS

## 7.1 Start Up Sequence

### 7.1.1 Prior Checks

Wiring Check

- Power and auxiliary connections to DIGIVEX POWER SUPPLY.
- Connection of any external energy recovery resistor and presence or absence of strap on terminal block B3.
- Wiring of Reset and Emergency Stop to DIGIVEX POWER SUPPLY.
- External arrival of 24 V source for motor brake on DIGIVEX POWER SUPPLY terminal block X1.
- Check resolver connections :
  - at motor end
  - at DIGIVEX DRIVE end.
- Check the power, brake and thermal sensor connections :
  - at motor end
  - at DIGIVEX DRIVE end.

**Power Supply Type Check**

- Power : 50/60 Hz, three-phase 400 V ± 10%.
- Auxiliaries : single-phase, 50/60 Hz, 400 V ± 10%.
- Brake supply : 24 V dc ± 10% (ripple included).

**Check the position of the DIGIVEX POWER SUPPLY straps** (ST1 / ST2 / ST3).

**Warning:** Before any work make sure that the power bus is at 0 V. Wait at least three minutes after the motors have come to a complete stop before carrying out any work. **The power and auxiliary buses must be at zero Volts when removing the drives from the rack, all the LEDs are switched off.**

### 7.1.2 Commissioning with PME-DIGIVEX Motion

See the Manual PVD3516

# 7.2 DIGIVEX Power Supply

## 7.2.1 Straps positions

**ST1** : No phase detection.

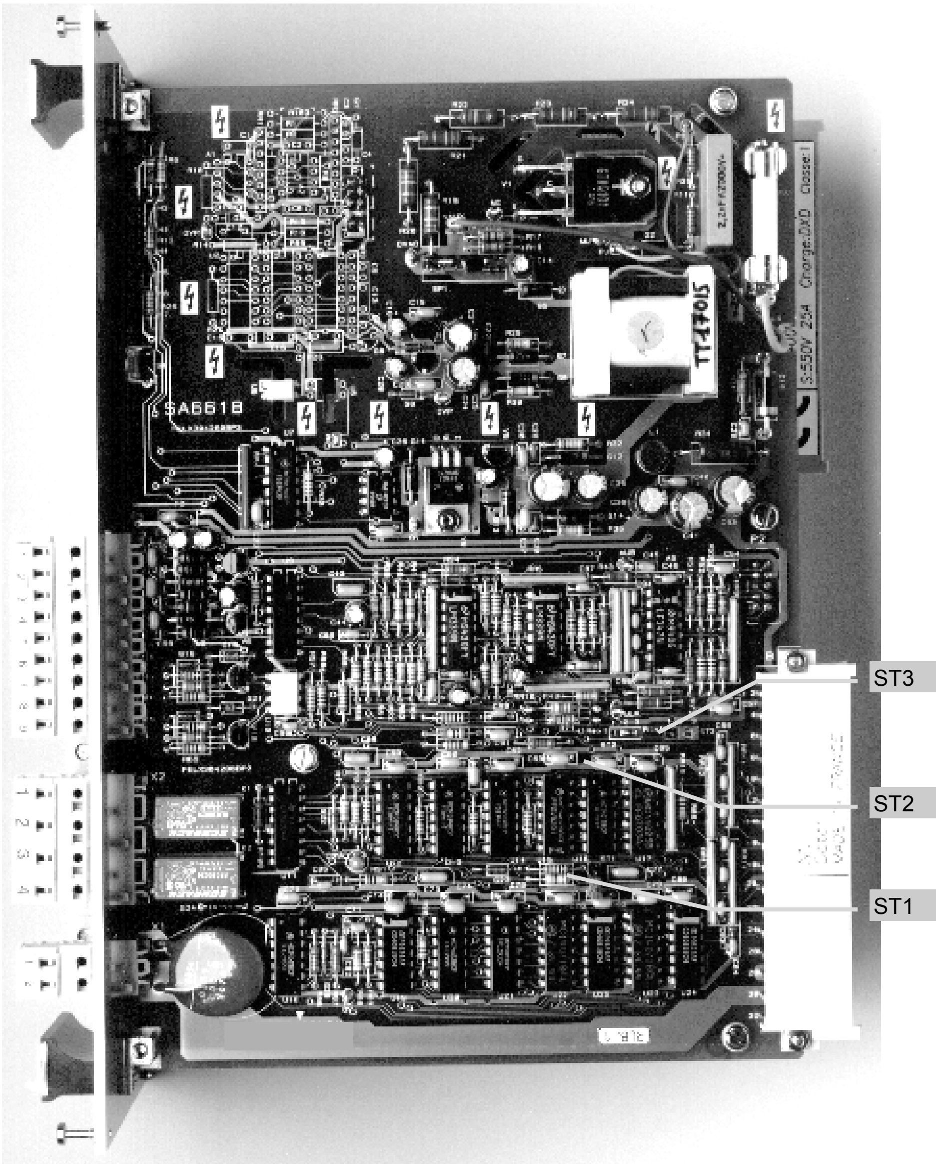
- fitted, no phase detection.
- removed, no detect. Single-phase operation at 20% of maximum capacity.

**ST2** : Regeneration cycle. See §1.4.3. Strap ST2 is not fitted on 12 kW Power Supplies.

**ST3** : Power bus discharge.

- between 1 & 2, bus discharged via regeneration resistor if bus voltage falls below 200V. With this option the bus discharging time can be higher than 5 seconds.
- between 2 & 3, bus discharged upon supply cut out (no mains supply detection). Approximately 100 ms after motors stop.

Standard configuration: ST1 and ST2 fitted, ST3 between 2 and 3.



## 7.2.2 Initialization Sequence

Upon energizing :

- T0 ← Mains present
- T0 + 100 ms → OK relay closed
- T0 + 700 ms → Main switch closed capacitors precharged
- T0 + 800 ms → Regeneration test OK
- T0 + 940 ms → INIT signal

The INIT. (initialization) signal enables the drives to be released.

## 7.2.3 Stop Sequence

### 7.2.3.1 Normal stoppage

Normal stoppage is achieved by deliberately opening the main contactor.

| | |
|---|---|
| To | ⇐ contactor opened |
| To + 10ms | ⇒ "POWER OFF" LED comes on |
| To + 20ms | ⇒ OK contact on terminal block B5 opens |
| To + 20ms + delay | ⇒ The motor is no longer controlled after the bus has discharged. The "POWER ON" LED goes out.<br>Discharge time depends on positioner activity during this phase. |

### 7.2.3.2 Stoppage subsequent to mains supply or braking fault

| | |
|---|---|
| To | ⇐ Fault detected |
| To + 20ms | ⇒ The OK contact of terminal block B5 opens and displays the type of fault at the supply side via a set of LEDs.<br>The external automatic control must then open the main contactor at the latest 100 ms after the OK relay opens. |
| To + 20ms +Tr | ⇒ The "POWER OFF" LED lights. (Tr be the contactor opening delay). |
| To + 20ms +Tr+delay | ⇒ The motor is no longer controlled after the bus has discharged. The "POWER ON" LED goes out.<br>Discharge time depends on positioner activity during this phase. |

### 7.2.3.3 Stoppage subsequent to motor drive fault

| | |
|---|---|
| To | ⇐ Fault detected |
| To + 10ms | ⇒ The motor is no longer controlled. The 7-segment display shows the fault in question. |
| To + 20ms | ⇒ The OK contact of terminal block B5 opens.<br>The external automatic control must open the main contactor at the latest 100 ms after "OK" opens.<br>After the main contactor opens "POWER OFF" LED comes on. |
| To + 20ms + delay | ⇒ "POWER ON" LED goes off, |

N.B. Mains failure entails bus dc voltage discharging two seconds later whatever the stop mode.

# 7.3 Detecting Reasons for Stoppage

## 7.3.1 LED display - power supply function

| LED | COLOR | FUNCTION |
|---|---|---|
| POWER ON | Green | Power on, with no fault in the supply or in the drive control. |
| POWER OFF | Red | Auxiliary supply on. No power supply (either because of a fault, or by switching off). |
| RECOVERY | Red | Either, if temporarily on, normal switch in of recovery resistor Or, if permanently on, recovery fault or resistor short-circuited (valid only for external resistors). |
| OVER VOLT | Red | Flashing: mains supply overvoltage 480V or 255V<br>Fixed: bus overvoltage 750 VDC or 400VDC |
| PHASE | Red | No mains power phase. |
| AUX. SUPPLY | Green | Indicates auxiliary supply is on. |

In normal operation, the LED status is as follows:

- POWER ON Green
- POWER OFF Off
- RECOVERY Off
- DRIVE FAULT Off
- DC OVERVOLT. Off
- AC OVERVOLT. Off
- PHASE Off
- OVER TEMP Off

## 7.3.2 DIGIVEX Motion

Any problems arising may be displayed in either of two ways:

- A DRIVE FAULT LED on the front panel of the DIGIVEX Power Supply module indicates there is a problem with one of the axes.

- An 7-segment display on the front panel of each DIGIVEX Motion module shows the servoamplifier's general status: DIGIVEX Motion module PME software must be used to show, in plain language, status and fault information together with advice for correcting faults.

# 7.4 7-segment display status

Function: To provide information on the DIGIVEX status distinguishing between faults.
Description :

| Description | Display | status _ number | Status |
|---|---|---|---|
| *Stand by without power with execution of application program* | 0 | 36 | Information |
| Stand by without power *without execution of application program* | blinking 0 | 1 | Information |
| *Power present with execution of application program* | 1 | 21 | Information |
| *Power present without execution of application program* | blinking 1 | 2 | Information |
| *Resolver failure* | 2 | 3 | Major Fault |
| *Encoder fault* | blinking 2 | 37 | Major Fault |
| *Excessive ambient temperature* | 3 | 4 | Major Fault |
| *Excessive heatsink temperature* | 3 | 5 | Major Fault |
| *High heatsink temperature with reduced current* | blinking 3 | 6 | Information |
| *Excessive motor speed (in rpm)* | 4 | 7 | Major Fault |
| *Excessive application speed (in Units/s)* | 4 | 35 | Major Fault |
| *Excessive supply current* | 5 | 8 | Major Fault |
| *Excessive variable speed drive current* | 6 | 9 | Major Fault |
| *Excessive dI/dt* | 6 | 10 | Major Fault |
| *Excessive average current* | 7 | 11 | Major Fault |
| *Excessive RMS current* | 7 | 13 | Major Fault |
| *Excessive average current with reduced current* | blinking 7 | 12 | Information |
| *Excessive RMS current with reduced current* | blinking 7 | 14 | Information |
| *Bus overvoltage* | 8 | 15 | Major Fault |
| *Excessive motor temperature* | 9 | 16 | Major Fault |
| *Option card fault* | 11 | 29 | Major Fault |
| *Incompatible Axis/Spindle definition* | A | 17 | Major Fault |
| *CAN or Profibus connection fault* | b | 18 | Major Fault |
| *Motor not connected* | C | 19 | Major Fault |
| *User program memory fault* | d | 20 | Major Fault |
| *Emergency stop* | E | 38 | Major Fault |
| *Personalization board missing* | F | 22 | Major Fault |
| *Axis / personalization board incompatible* | F | 23 | Major Fault |
| *Internal parameter calculation fault* | F | 24 | Major Fault |
| *+ Electrical limit reached* | H | 25 | Minor Fault |
| *- Electrical limit reached* | H | 26 | Minor Fault |
| *+ Software limit reached* | L | 33 | Minor Fault |
| *- Software limit reached* | L | 34 | Minor Fault |
| *Program execution fault* | P | 27 | Minor Fault |
| *Tracking error fault* | U | 28 | Major Fault |
| *C167 CPU Fault* | **.** | 31 | Major Fault |
| *DSP CPU Fault* | **.** blinking | 32 | Major Fault |
| *Synchronization message timeout* | blinking b | 41 | Minor Fault |
| *Licence missing* | blinking F | 42 | Minor Fault |

Major faults cause the OK relay to open.
Minor faults cause an operating error to be displayed.